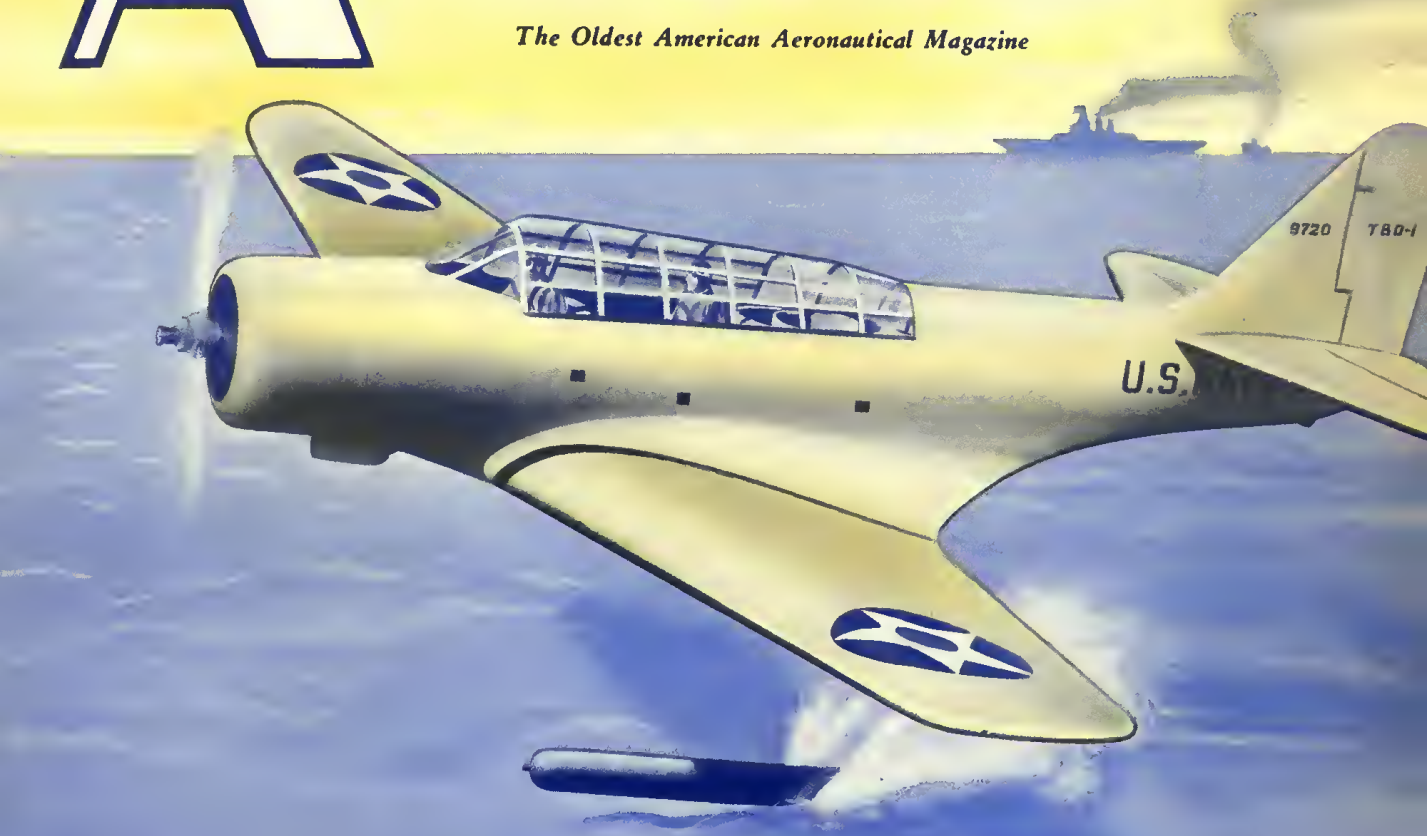
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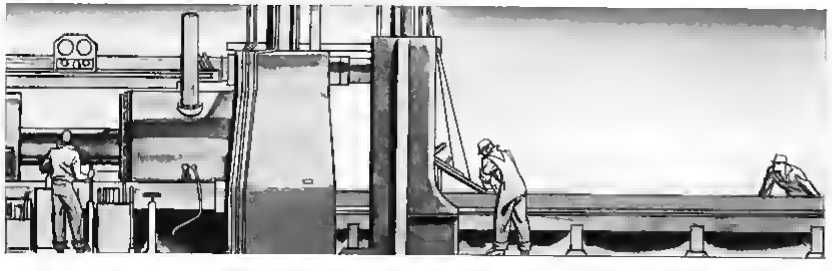
The spectacular new 100-passenger transoceanic planes now in the making illustrate a bit of business philosophy.

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presses which would be useless if the idea did not hatch. And it takes thorough-going technical knowledge of the job to be done to justify the risk of such heavy investment in advance of profitable volume.

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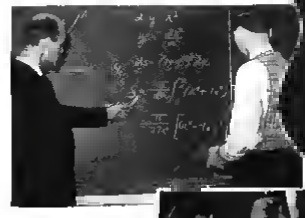
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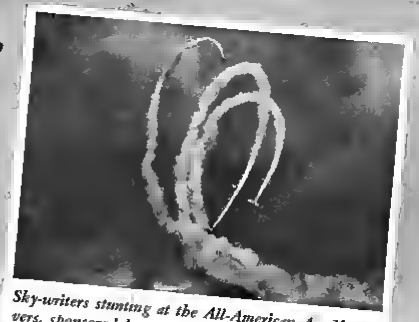
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BOEING SCHOOL RECORD
(October 1937 — September 1938)

Months	Graduates	Placements	No. Cos. Employing Graduates
1937			
October	4	3	2
November	2	2	2
December	29	7	3
1938			
January	7	14	6
February	1	9	7
March	49	14	6
April	6	13	3
May	6	12	6
June	30	5	4
July	4	8	4
August	2	3	3
September	29	12	10
TOTAL	160	104	28

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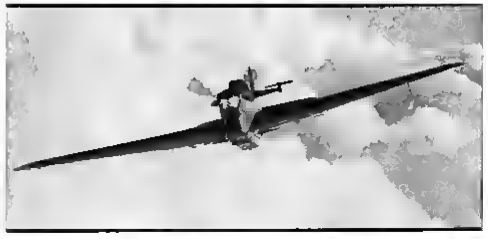
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A. R. A. F. Hawker Henley with Rolls Royce Merlin Engine

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A McGRAW-HILL PUBLICATION

1938

—another year of achievement for LOCKHEED

Throughout the Lockheed Empire, momentous occasions of this world have been reflected this year in the silvery sheen of Lockheed Electras, 12s and 14s

As Prime Minister Chamberlain alighted from his third British Airways-Lockheed flight to Germany, war-frightened people of all nations relaxed, but with a new appreciation of the importance of modern aviation to peace

Howard Hughes, in a sensational globe-circling dash, proved his confidence in the Lockheed 14 he had selected for the gruelling flight Five Polish flyers, accepting delivery of a 14, ferried it from Burbank via Mexico, South America, the South Atlantic and Africa to Warsaw The Lockheed built XC-35 sub-stratosphere airplane won the Collier trophy for the United States Army Air Corps

Notable in commercial aviation has been the Trans-Canada Air Lines inaugural flight between Montreal and Vancouver and their selection of Lockheed Electras and Lockheed 14s for the first passenger, mail and express services between these points Lockheeds are playing a part in various expansions of the vast KLM and KNILM operations in Australasian territory, South America and the West Indies New routes are being developed between Darwin and Adelaide by the Trans-Australia operations of Guinea Airways in conjunction with Empire flying boats and KLM Royal Dutch Airlines.

British Airways, French "Air Afrique," Polish Air Lines "LOT," Rumania Airlines "LARES," Jugoslavia Airlines "Aeropout," Venezuela Airlines "Aeropostal," Union Airways of New Zealand, MacRobertson-Miller Airlines in Australia and Northwest Airlines in the United States have added new Lockheed equipment.

In the military field, deliveries of Lockheeds are being made to the United States Army and Navy, the Argentine Army, the Australian Air Board, and to the Colonial Department of the Netherlands East-Indies. A large order for Lockheed B-14 bombers was placed by the British Air Ministry.

Lockheed airplanes embody the accrued benefits from years of successful pioneering of things new to aviation The achievements of 1938 have likewise influenced the design of airplanes now being engineered for future use in Lockheed's Empire of the Air.

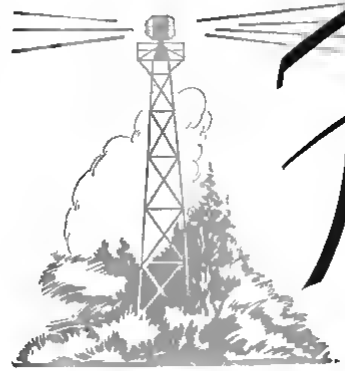


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Flashes

From the Skyways of the World

IN THIS ISSUE

For our readers abroad is included the second issue of L'Aviation internationale a summary of the December issue content in English and three other languages,—Spanish, French, and German. This feature has been a regular part of all issues going abroad since November and constitutes an entirely new editorial service It is hoped that it will help our readers who are unfamiliar with the English language to understand those articles in which they are most interested and set them aside for reference or possible translation. . . . First impressions of the aeronautical industry abroad are given in a letter from your editor who is now in England on the first lap of a tour of Europe. More details will follow in the January issue . . . Fresh from recent globe-trotting, Parker Van Zandt tells why all first class mail should go by air in the European manner . . . Manufacturers questions on the Wages and Hours Law are answered from headquarters in a survey conducted by Blaine Stubblefield of our Washington office . . . Captain Holden C Richardson, U.S.N. Ret. outlines catapult history and discusses the engineering problems concerned with the forces acting on a catapulted ship In the first of two articles, . . . From Seville comes a picture story of the flight tests of the Boeing 314 Clipper . . . . Our West Coast Editor reports on the essential details of the proceedings at the S.A.E. Production Meeting at Los Angeles . . . . Details of the pressure cabin structure of the Curtiss Wright 20 are shown pictorially for the first time . . . New airplanes include the Ryan SC Seversky 330 mph Executive Cunningham Hall Freighter Aeronca 50 Seaplane.

» PHILADELPHIA'S BROTHERLY LOVE has extended to the rotary wing aircraft manufacturers since Representative Dorsey got his bill providing $2,000,000 for development work on these machines through Congress. A record crowd turned up to discuss the design problems and applications of these ships at the late October meeting of the Philadelphia Chapter, Institute of the Aeronautical Sciences An encouraging spirit of cooperation was observed among the sponsors of autogiros, gyroplanes, helicopters and convertaplanes and it looks as if the government would certainly get the best possible results with its money. And anyone who wants to put on a highly successful technical meeting should try to retain the services of Committeemen Wilford, Larsen, Le Page Prewitt, Ray, and McCarren From England came Raol Hafner, gyroplane designer who is just starting work on a development contract with the British Air Ministry. A feature of the entertainment was a special preview of the new movie "Men With Wings" by Paramount arranged through Philadelphia's Aeronautical Host No. 1, Alfred L Wolf. The presentation was most enjoyable in spite of the fact that we had seen it only two nights before after the "Men With Wings" dinner in New York.

» WINCH TOWING MAIL BAGS is the latest interest of Dick du Pont. We found him all tangled up in a maze of ropes cables hooks and cutters in a shop on du Pont Airport Installed in his ship is a neat little winch, not to tow soaring ships, but to handle mail bags using the Adams pickup and delivery system A demonstration of the device was held Oct 5 for the enlightenment of the press and others by All American Aviation, Inc., bidders on the contract to be let by the Post Office Department for two routes using mail pick-up and delivery service.

» BELLANCA IS BUSY on a number of orders for export and plans are underway to introduce and distribute the new light ship seen for the first time at last year's Chicago show Filling the gap in price range between the present light planes and ships of the Fairchild-Stinson-Waco class, the new Bellanca should interest private owners seeking such a stepping stone Another popular Bellanca model is the new 28-110 (see AVIATION for November) a still more powerful and refined version of the famous Flash

» FOR YEARS we have admired the eloquence and appreciated the quality of the prose in Gil Rob Wilson's speeches and written works But we didn't realize that Gil had been writing poetry The other day we received a copy of his book, "Leaves From an Old Log," and spent a delightful evening with it. No matter what branch of the business you are in, you will find relaxation and genuine pleasure in leafing through Gil's Old Log



» AMELIA is going to have the type of memorial she would have wished Alma Mater of her forefathers Thiel College of Greenville Pennsylvania has established the Amelia Earhart Foundation formally inaugurated at a meeting held recently at the White House at Mrs. Roosevelt's invitation The idea developed partly as a result of a conversation between Amelia and the President of Thiel shortly before her last flight. Its principal objectives are the endowment of post graduate scholarships in science and sociology for women of any accredited college at the school of their choice and the building of a residence hall for women on Thiel Campus Administration will be entrusted to a separate board of trustees now being selected A sum of $500 000 is required to fulfill the objectives of the Foundation Initial objective will be ten annual scholarships valued at $1000 each and expansion will follow as rapidly as funds become available An impressive list of sponsors under Mrs. Roosevelt's honorary chairmanship already has been announced Offices of the Foundation are at 60 Forty-Second St., New York and Union Trust Building in Pittsburgh.

» DESIGNERS OF SAILPLANES and students of the technical aspects of soaring flight will be interested in a report entitled *The Soaring Cycle* prepared by Arthur Halsted and published by the Soaring Flight Company of Washington, D. C. The report is a detailed technical analysis of soaring flight in 58 single spaced typewritten pages with vector diagrams showing the forces acting on a sailplane in various flight positions.

» CHALK UP ANOTHER MILESTONE along the meteoric paths of progress blazed through uncharted skies by daring aviation engineers, for we found on a tour of the new Boeing 307 "Stratoliners", now nearing completion in the Seattle factory, that the coathangars in the men's washroom are fully retractable This is one more step towards the ideal of a fully retractable airplane. Unlike the trick rubber coathangars sold by joke shops the "Stratoliner" "retractohooks" cling firmly to one's coat and then, when the coat is removed, they automatically and unostentatiously retire into preconceived and well concealed wall compartments

» SINCE the story of the flood of cartwheels from American Airlines employees we have heard many other "dollar stories". Here is one. The other day Dick White, an employee of the Washington Aircraft & Transport Corporation, Boeing Field, Seattle, found a dollar, but this was no ordinary dollar bill It was a "Short Snorter", which had belonged to the late E. E. Dildine, former instructor at Sand Point Naval Air Station On it were the signatures of such men as Les Tower, Eric Nelson, Joe Crosson, Ansel Eckmann, Stew Jolly, Emory Bronte, Alex Holden and R E. Koenig We didn't know either what a 'Short Snorter" was until we investigated and learned that way back in the early days of aviation, around 1928, Gordon Mounce started the idea to keep pilots from going completely broke. It seems that every pilot who had a dollar bill got all his pilot friends to sign it. That was a "Short Snorter". When a pilot was caught without his "Short Snorter" or didn't yet have one, he had to fork over a dollar to every pilot present who could produce a "Short Snorter". Presumably the pilot who was caught short did the snorting.



Maguire has to light the stars since the cherubs were fired because of the Wages and Hours Bill

» GREAT BRITAIN also announces that it has developed a new *training* plane with a 300 mile an hour top speed We'll bet that training planes' Grandfather, the Avro, would never recognize the offspring of the second generation

Perhaps we are an old sentimentalist or something but we think that designers of training planes should never have given up the practice, started with the famous 'Jennies," of having holes for a couple of non-existent instruments in the instrument board The holes were perfect places for the pilot to stuff his gloves, set up his pack of cigaretts, and hang up the speaking tube. It also enabled him to stick his chewing gum on the back of the instrument board instead of on the front where it would be unsightly.



"Mony a Mickle
Makes a Muckle"

HOW well the Scot understands the virtue of care for the small things! And how well the aircraft industry knows this truth! Bendix Airplane Wheels and Brakes, and Bendix Pneudraulic Shock Struts themselves, are details—enormously important, but nevertheless, details. And within them—making them so thoroughly efficient—are still smaller details, each one the result of carefully correlated research and a great deal of experience. Bendix wheels and brakes, for example, have proved themselves in more than five million take-offs and landings. Vital data gained from this experience is at the command of your engineering staff every time you consult Bendix on an undercarriage layout.

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Side Slips

By
ROBERT OSBORN

» A NEWS ITEM states that during the recent war scare in England the Wright brothers' first airplane was moved into the vault of the South Kensington Museum to prevent possible damage by aerial bombardment. Paradoxically, if the first airplane hadn't been invented it wouldn't be necessary to protect the first airplane.

» THE OCTOBER FINANCIAL PAGES were full of mournful headlines:

"Whoosis Aircraft Earnings Drop To $500,000 Third Quarter."

"Whatsis Aeronautical Co. Backlog $25,000,000, Down $2,000,000."

Instead of being saddened by this news we should be pleased with the **tone of these headlines**—definite indications that the aviation industry is being accepted in the blue chip class by big business. In the next "worst depression in history" we'll undoubtedly rate headlines all of the way across the front pages of the New York newspapers similar to 'U. S. Steel Drops Below 100.'

» ANOTHER GOOD EXAMPLE of the rapid strides being made by aviation these days is the report of the study



of the life ambitions of 3400 school children in Illinois. This showed that the aviator had completely eclipsed firemen, motormen, and candy store owners. The present ambitions of the boys are, in the order of their preference, aviators, engineers, athletes, doctors, cowboys. We are sure aviation could even win over the cowboy contingent if some aeronautical greeting could be developed by a radio program which would be as popular as the 'Hi Ho Silver!' of the Lone Ranger.

» AT THE ROTATING-WING CONFERENCE of the Institute of the Aeronautical Sciences in Philadelphia one speaker predicted that, in the near future, helicopters would be operating regular taxi and bus schedules between city centers and suburbs. This seems perfectly plausible to us, but we can foresee some minor changes from present land taxi and bus practices which will be necessary:

1. Passengers wearing parachutes should be required to pay fares in advance.

2. Driver-pilots should be provided with a radio beam audible to the passengers to prevent them from flying the long way around Central Park to run up the fare.

3. Machines will have to be designed for terminal velocity dives with high G pull-outs, as competing taxi drivers are likely to be diving for the same customer.

4. Meters will undoubtedly be devised to charge the passenger for 'Hovering time'.

5. It will be desirable to equip the tips of the rotor wings with fenders or bumpers which will make a loud noise when crushing, to indicate to the pilots when they are flying too close to each other.

» WE ARE NATURALLY ENTHUSIASTIC about the Administration's proposed plan to make the air forces of this country the equal of any in the world, and to back up this program with the training of an equivalent force of aviation mechanics. First reports indicated that the apprentice aviation mechanics would be obtained from the young men enlisted by the National Youth Administration, an adjunct of the W. P. A. which sounds fine. However, we don't think it would be practical to train W. P. A. workers as aviation mechanics as we doubt that modern airplanes are strong enough for a large group of men to lean against.

» FOR A COUPLE OF GENERATIONS Winsted, Conn. has been famous for its perennial newspaper reports of talking dogs, four-legged roosters, swing-dancing horses, and aged turtles. However, the arrival of the flying age seems to have developed a challenger for Winsted's title, as we have a report from Wausau, Wis., that a squadron of a thousand geese circled the city a number of times after dark and then spent the night at the airport after the landing lights had been turned on for them. The Wausau publicity man shows his inexperience, however, when he failed to add that the leader of the flock came into the



operations office for winds aloft, weather en route, and Kollsman readings before the morning take off.

» ALSO, on the subject of Unnatural History, we read that reports of fish raining from the skies may actually be true in the future, as the federal fisheries authorities have discovered after numerous tests that the most practical way of re-stocking remote trout streams and lakes is by simply pouring the fish out of the windows of low-flying airplanes.

» WE SEE BY THE PAPERS that cowboys are now using airplanes for rounding up wild horses in Nevada and nearby western states. This suggests the possibility of a new act which might be popular in the western rodeos,—a cowboy, wearing a parachute of course, trying to stay in the cockpit of a badly unstable airplane.



Shadow of DC-4 crossing beam field

To the President of the United States:

THE POTENTIALITIES OF THE AIRPLANE as an instrument of war has been brought home dramatically within the past few months to every person who could read a newspaper or listen to a radio. To the world it seems as though the relationship of nations has been changed overnight by the new bargaining advantage of the statesman backed up by the most bombers. As the Commander in Chief of our military forces, you, Mr. President, have been quick to appraise the situation and announce your intention to take great steps to increase the strength of our air forces.

You have made a first-hand inspection of current military and naval aircraft types. You have summoned advisers from a half-dozen branches of your administration. As we go to press, the words of one of them, Louis Johnson, your Assistant Secretary of War, are fresh in the latest editions of the newspapers: "Yesterday we believed that a program calling for 2,320 airplanes of all types by 1940 would protect us against any enemies from the air. Today these figures are far below our immediate needs . . . We must double, yes treble, and perhaps even quadruple our present air force . . . Mass production of airplanes we must achieve in this country and we must do so immediately."

Now, no one goes along with your plans for American air power more than this magazine. For a generation we have watched the steadily growing importance of air power—have sometimes been called hare-brained enthusiasts for our conviction that it would some day rule the world. Of recent years, as nation after European nation has pitched into tremendous programs of aerial armaments, we have time and again pleaded for a stepping-up of our own efforts.

But don't let's get stampeded. First of all, remember that through recent years—especially since the beginning of your own administration—the aerial strength of our Army and Navy has already made great progress. For the past five years, at least, our engineers and designers have enjoyed world-wide leadership. During that period, partly under the impetus of steadily increasing military appropriations and the growth of our air transport system, but more particularly stimulated by export demands, aircraft production in this country has more than quadrupled. Should we increase our current output not one iota, our military services should still reach a first-line strength of 4,320 planes by June, 1940. Such considerations do not justify tremendous upheavals for the mere sake of "mass production of airplanes . . . immediately."

Let us admit that our Army and Navy together should possess double that number of fighting planes. But let's remember that aircraft are but one part of the program we must undertake to achieve such a force. The 36,000 skilled workers in our aircraft plants will have to be at least doubled. We must quadruple the commissioned and enlisted strength in the air branches of our services. To do that, we must work out complicated problems of service promotion and pay to attract the high type of personnel required and then we must give each and every new recruit a long and thorough course of training. We must vastly enlarge the housing, airport, and service facilities of both the Army and the Navy. Probably, we must include a nationwide program of youth training.

Then, and only after considering all these things, let us approach the question of aircraft procurement. And in that let us make full use of the one advantage that falls to the lot of the laggard—let us learn from the obvious mistakes of our contemporaries. The problem facing us is not the complete lack of a military air force which faced Germany at the beginning of her building. Let us not, as she did, rush into the production of obsolescent aircraft for the sake of mere numbers. American aircraft are characteristically far more open to "volume" production than are British types. Let us not make England's mistake of enlisting a vast number of non-aeronautical firms in a costly and hard-to-get-started "shadow plan" on the policy that it is easier to swing mass production industries into the building of aircraft than it is to speed the production methods used by the aeronautical industry. From France, let us learn that nationalization of aircraft production within a democracy is no good—not through any appeal to traditions or prejudices, but simply because it will not produce aircraft.

The answer, Mr. President, is a coordinated step-by-step increase of airplane procurement over some practical period of time. Let us draw up our program in all its phases. Let's start training new personnel. Let's rush work on airports and bases. Let's select the very latest and most advanced aircraft the services can approve for production. Then let's tackle contracts for these types in lots of 200 to 500. With such opportunities for "volume" production, the industry—without building a single new plant—can double its output by next summer. By 1940, the earliest possible date at which the services can have pilots and ground crews ready to man them, the industry's output—by sound and orderly extensions— can reach the rate of at least 4,000 military planes per year. Moreover, by promptly replacing each contract completed with another for a new and improved type, those planes will continue to be equal or superior to any aircraft in the world.

But, let's foreswear all rosy dreams that we can rush the aircraft industry overnight into "mass" production along the automotive pattern of tens, even hundreds of thousands of identical units. Before even the machinery could be finished for producing aircraft by such methods, the planes for which it is designed would be thoroughly obsolete.

The Editors of AVIATION

Post-Munich Impressions of Aeronautical England

London, Eng
November 11, 1938

Dear Les,

With considerable regret I am now making final preparations for departure from England During the two weeks I have been here I have been treated to a degree of hospitality (both official and private) that would be difficult to equal elsewhere

Evidence of British hospitality cropped up almost as soon as I was ashore. In the customs shed, much to my surprise, a gentleman accosted me by name introducing himself as Rex Haswell, Imperial Airways' representative at Plymouth. Later in the day, on arrival at Paddington Station in London, Mr Soanes, also of Imperial, turned up Both were very helpful in making customs and travel arrangements. I could see the fine Italian hand of Paul Bewshea in the business

Through the good offices of Commander Harold Perrin, Secretary of the Royal Aero Club I was tendered an Honorary Membership, which entries with it the privilege of living in the Club's headquarters at 119 Piccadilly I had been here before (in 1936), so soon settled down to a very comfortable existence in familiar surroundings

My first views of London of 1938 gave me a profound shock. Although we had all read of the preparations made here against possible air attack during the September crisis, distance has lent a considerable degree of unreality to the reports. But to run smack into sandbag barricades, and to stumble across great trench systems in the parks (there is one such shelter in the Green Park within sight of my window) gave me, I must confess, a slightly hollow sensation Most striking, however, is the host of posters on walls and buildings all over England urging citizens to join up in A.R.P. (Air Raid Precaution) groups—also thousands of posters directing people where to go to obtain gas masks, and offering directions as to the care and use of masks Everyone here has a mask in his home or office.

The British people have come face to face with the realities of swift and destructive warfare, and have settled down with a grim determination to prepare themselves for any eventuality. Some of the efforts that were made under pressure in the final hours of the crisis were so completely inadequate as to be almost funny, but they yielded valuable lessons, and the people here are now determined to fill in the gaps that the crisis made obvious

Of course, the air re-armament program has been of most intense interest to us Thanks to the preliminary work done for me many weeks ago by our good friend, Group Captain George Pirie, in the British Embassy at Washington, little time was lost in getting cleared for permission to visit British factories Major A R Boyle at the Air Ministry, and his assistant on the American desk, Squadron Leader Anderson, were extremely cordial and co-operative, and Commander Harrill and Colonel "Mike" Scanlon of our own Embassy, made the necessary official matters very simple

Once these formalities were out of the way, I call upon two of my old friends, Captain Laurence Pritchard of the Royal Aeronautic Society, and Harold R Gillman of the Society of British Aircraft Constructors Between them we made up a schedule of visits in various parts of the English Industry that has kept me well on the move ever since.

Pritchard and Gillman, incidentally, occupy somewhat similar positions here as do Lester Gardner and Leighton Rogers with us. The Institute of Aeronautical Sciences was patterned to a large measure on (and keeps closely in touch with) the Royal Aeronautical Society The S B A C., as I understand it, functions somewhat as a cross between our Aeronautical Chamber of Commerce and the Manufacturers' Aircraft Association

Here is a skeleton outline which can be amplified later:

TUESDAY, NOVEMBER 1ST: Discussion of U S and British manufacturing problems with Gillman and Boyer, S.B.A.C Luncheon with R. Brennard, Imperial Airways. Visit with Captain Laurence Pritchard, R A S Tea with C. G. Grey of *The Aeroplane* Discussion of Empire Routes, equipment and operating problems with Major Brackley of Imperial Airways at I. A Victoria offices

WEDNESDAY, NOVEMBER 2ND: Met General Caddell of Vickers at Waterloo Station, and by rail to Weybridge Plant. Discussed "Geodetics" with Mr Wallis Inspected plant and details of the "Wellington" bombers (The 3 "Wellesleys" that set the new long distance record a few days later were of geodetic construction). Inspected aerodrome and A R P. work Luncheon at Vickers with General Caddell, Mr Westbrook (general manager) and Squadron Leader Griffiths of the R A F. Up to London to Vickers head office. Met Capt Broome, who had shown me the Southampton plant in 1936

To Victoria for tea with Sir John Reith, new Chairman of the Board of Imperial Airways Later to Major Mayo's office to discuss "Pick-a-back" flying and transatlantic problems

Dinner with Mr. Henry Tate at his home

THURSDAY, NOVEMBER 3RD Pushed off from Paddington on the "Bristolian" (a remarkably fast train, by the way) for a three day tour of the Midlands First day at Bristol's airplane and engine plant with Mr. Proctor-Gregg and Mr. Roy Fedden Production in full blast of "Blenheim" bombers and the complete line of Bristol engines—the poppet value "Mercury" and "Pegasus"—and the latest sleeve value types, "Perseus" and "Hercules". Took a late afternoon train from Bristol and put in at Birmingham for the night.

FRIDAY, NOVEMBER 4: Near Birmingham saw the first of the great "shadow" factories now getting into production The Austin Motor Car Company are building Fairey "Battles" in a big way, also Bristol engines Mr Ledgard, General Manager and Mr Mitchell (formerly associated with Burnelli's British project) went through the plane and engine manufacturing departments with me, and Wing Commander Stack (who held many RAF records) took esre of me in the flight departments

Followed, in the early evening, another hop by L.M.S.R.R. to Manchester

SATURDAY, NOVEMBER 5 The Fairey Company's Stockport plant (near Manchester) is the base plant for "Battles" Had a very pleasant and interesting time with Major Barlow, going through his extensive manufacturing departments Can't say anything about production figures, but it is obvious that the RAF isn't lacking for Battles'.

SUNDAY, NOVEMBER 6: Decidedly non-aeronautical Spent most of the day wandering about the ancient buildings of Oxford (Recommended)

MONDAY, NOVEMBER 7: A long train ride (8.20 to 11 03) from London's St. Pancras station to Derby, home of Rolls Royce engines. Chief Engineer Elliott and his assistant, Mr Ellor, gave up a whole day to showing me how these famous engines are made, and in discussing matters of common interest in the comparative positions of U.S. and England.

By car to Nottingham (14 miles from Derby) to catch a fast train up to London to meet Ted Wright for dinner at 8

TUESDAY, NOVEMBER 8: A most interesting day, spent mostly in the air with Squadron Leader "Andy" Anderson in an RAF Miles "Mentor". Took off from the RAF base at Hendon and first visited a fighter squadron (Hurricanes and Gauntlets) at North Weald

After lunch in the officer's mess, Squadron Leader Hancock (in command) turned out a flight of Hurricanes and put them through the works over the field After the demonstration we pushed off again in the Mentor and cruised about over a large section of the outskirts of London, circling or dropping in at a number of aerodromes. At Fairey's Great West Aerodrome, stopped in for a chat with Staniland, one of England's best test pilots, soon to make a trip to the States Went to diner with the C. G Greys, a most interesting evening Among the guests were Mr and Mrs. Ivor McClure. Mr McClure is connected with the civil aeronautics side of the Air Ministry and was much interested in the affairs of our CAA

WEDNESDAY, NOVEMBER 9: Major Reginald Nichol of Handley-Page who gave me a very good look at the manufacturing facilities at Cricklewood. Plant is now in full swing on Hendon's—originally described as the "flying suitcase" but much smoothed up in production as contrasted with the prototype which I had seen in 1936 A plessant and interesting luncheon with Reg and with Group Captain R. H. Maycock (H-P sales) and with Mr G R Volkert (in charge of production) During the morning was fortunate in catching Mr. Handley-Page for a few minutes conversation He has been recently in the States and in Canada.

Several weeks ago your Editor set sail for Europe and we were beginning to fear he was too busy to write home when this letter arrived. Written as a progress report rather than material for publication, we give it to you unedited in the hope that it will enable you to share the reactions of one entering the European scene at this critical period in its history. A more detailed study of the aeronautical situation abroad will appear in the January issue.

Back to London in time for one of the outstanding events of the week—T. P. Wright's lecture before the Royal Aeronautic Society on "Production Methods in Ameriea". Mr. Roy A. H. Fedden was in the chair. Seldom have any of our outstanding engineers presented our position so well, or to such a large and intensely interested British audience

Following the lecture a dinner was tendered Mr Wright by Mr. Fedden at the Park Lane. It was a most distinguished group that gathered about the table, representing the top-flight people of the British aircraft industry I was reminded of an equally brilliant affair given for Lester Gardner in 1936

At the dinner Ted gave a really great talk on the situation of the British aircraft industry. He said many plain things that coming from a lesser person might have been taken amiss, but he did it so well that he made a profound impression. It is a pity that certain of our more boisterous friends who have been here of late might not have been there to pick up a few points on international courtesies

Ted is now off on an extended inspection trip, but I hope to catch up with him again at the Paris Show.

THURSDAY, NOVEMBER 10: Spent most of the day with deHavillands, both at the Hatfield plant where their planes are built and at the original Stag Lane factory (now much expanded over 1936). Stag Lane produces engines (Gypsies of all types up to the big 12's for the Albatross and RAF types), and also great quantities of controllable-pitch propellers under Hamilton Standard license There is another DH propeller plant up north that is even larger than Stag Lane. It is impressive, however to see a battery of eight or ten of Henry Berliner's profiling machines continuously busy roughing out blades.

St Barbe, whom I had met in 1936, was out of town, but I was well taken in hand by Mr Thorn and Mr Walker, one of the directors. Made a tour of the Hatfield plant, aerodrome and flying schools with Mr. Sharpe of DH and spent some time talking civilian and RAF flight training with Mr. Radwell of the London Flying Club, and Mr. Pike of the DH school. One of the most interesting training plans in sight at the moment is the creation of the Civil Air Guard, a heavily subsidized training plan under which men and women from 18 to 50 (if they can qualify physically) can learn to fly for as little as 5 shillings an hour. I understand that 30·000 applications have been filed and that close to 5,000 have already been registered. Obviously, the country will require a great increase in small planes suitable for training and a lot of new instructors

FRIDAY, NOVEMBER 11: Today has been spent in dashing about London clearing up details before my departure for Germany tomorrow. Had visits with Mr. Ormsby-Cooke with Lawrence Wingfield (whom you remember visited us last Spring) lunched with Major Mayo (I.A.) and Major Stewart who is associated with Major Mayo in the composite scheme. Later called on John Millar (one of our contributors, and now with Mr Dowty of Aircraft Components, Ltd.) and paid my farewell visit to Captain Pritchard and Miss Barwood of the R A S Oliver Stewart dropped in at the Club for a few minutes this evening. Was in Piccadilly Circus today at 11 00 A.M. for the two minutes silence that is observed for the Armistice twenty years ago. It was a most impressive ceremony—and of particular significance in London in 1938!

With best regards to all,
SPJ



AIR MAIL?

While idealists here have dreamed of the advantages of carrying all first class mail by air without supercharge Europeans have been doing it. Fresh from abroad, the author has made a widespread study of foreign experience and presents it herewith.

By J. Parker Van Zandt

SINCE RETURNING FROM A SURVEY of some 22 European airlines, I am often asked: What is the most important recent development in airline operation abroad?

The answer, to my mind, is easy: the most significant advance in recent years in European air transportation relates to the carriage of unsurcharged mail. This summer the great majority of European countries have agreed to the principle of transporting *all first class letter mail by air without surcharge*, anywhere in Europe, whenever air carriage offers quicker delivery.

The principle is of fundamental importance. It is as revolutionary in its ultimate effects as was the introduction of the "penny post" something over a hundred years ago. At one stroke it transforms air transportation from an adventure into a matter of course from a luxury service into a public necessity.

Were the United States to adopt this basic principle, it would profoundly affect the entire development of American aviation. Hundreds of cities not on any airline at present would be brought into a nation-wide network. Local aviation enterprises would boom. The beneficial results would reach into every branch of the industry. And air transportation at last would be firmly set on the road to a self-supporting status.

Does European experience to date support these sweeping assertions? I believe it does. It is still too soon to attempt to measure all the effects or their ultimate extent, but there are plenty of straws in the slipstream to indicate "the shape of things to come." Let's look at the record.

Probably the first airlines in Europe to carry first class mail without surcharge were the Scandinavian companies. As early as 1924 some of the Scandanavian post offices adopted the principle of sending all letter mail by the fastest available means of conveyance, without charging any extra airmail fee. This provided the Swedish airline, A. B. Aerotransport, with an incentive to pioneer in the establishment of the first European night mail services, in 1928-30.

Indeed, the development of night flying abroad, as well as the extension of schedules to include the bad-weather winter months, may fairly be said to have been given its major impetus from the transportation of unsurcharged mails.

In 1931 the Swedish company was already urging the organization of a general European night air mail net for the exchange of ordinary letter post. International political and economic complications in Europe made it impossible to put the plan into effect. A number of interesting night airmail lines, however, have subsequently been established, first chiefly by the various Scandinavian companies and Deutsche Lufthansa, followed by other European airlines.

All Swedish, Danish, Finnish and now Norwegian foreign first class mail has been carried *without surcharge* on both day and night schedules for the past several years. And it is not without significance that the relative amount of subsidy paid these Scandinavian companies today, *is less in proportion to their total income* than in the case of any other European airline.

The application in Great Britain of the principle of transporting unsurcharged mail by air has had much to do with the recent phenomenal expansion of British internal air services. For years it was implicitly assumed that distances within the British Isles were far too short and the weather too unpropitious to justify granting Government encouragement to internal airlines. In fact the few struggling companies were officially snubbed by at least two Government committees.

Four years ago, however, British postal officials experimented with sending ordinary letter mail by air from Scotland to the Orkney Islands. The results exceeded all expectations. Little Highland Airways (now a part of Scottish Airways) was the "chosen instrument" and the way they set about convincing skeptical Post Office authorities is an epic in air transportation.

The route from Inverness to Kirkwall across the turbulent Pentland Firth, off the north tip of Scotland, does not have the best flying weather in the world. What the Orkney natives call "a breath of wind" is really a small gale. Winds of seventy to eighty miles an hour are not infrequent. In addition, planes were far from the best and the route lacked much needed navigational equipment. But in spite of hell and high water, Capt. Fresson and his pioneering associates hung up such a record for reliability that today all first class mail to the Orkneys goes by air as a matter of course, winter and summer. In the last sixteen months they have never missed a single day of their daily schedule!

Thus encouraged, Post Office officials extended the principle to other points within the British Isles, where air services offered the possibility of accelerating mail delivery. Today the Isle of Man, the Jersey Isles, Belfast, Glasgow, Perth and many other points receive a supplementary airmail service at ordinary rates. Over a million pounds of unsurcharged mail per year is transported on British internal air routes. The addition of an overnight service to Dublin will shortly add another ten thousand pounds daily. And this is only a beginning.

This mail requires no special marking or extra postage. The public is unconcerned whether letters go by ground or air transport. What they do know is that they are getting the advantage of the best available delivery. Contracts are at rates not in excess of income. The Post Office phrase is: "a reasonable rate for reasonable carriage," a form similar to that long used in agreements with British rail carriers, which have had to be arbitrated only three times in the last hundred years.

The principle was extended to the Continent in February, 1936, when for the first time in the history of air mail transport, letters and postcards were flown from England without surcharge. This was on the route of British Airways, Ltd., to Malmö, Sweden.

In August of last year British Airways received a three-year contract from the Government to carry unsurcharged first class mail on a night service between London and Berlin, in conjunction with Deutsche Lufthansa. Mail for northern Europe is transferred at Hanover, to planes of the Scandinavian airlines. Between one and two tons of unsurcharged mail goes out of Croydon Airport every night of the week.

The present enviable position of British Airways, Ltd., as the second company to Imperial Airways, is largely due to the helpful stimulus which they received at a critical time in their history from contracts to transport unsurcharged mail. Today all British letter mail to all European countries (except the Iberian Peninsula) is sent forward by air without extra charge, whenever air transport affords quicker delivery.

But British officials had a still more ambitious scheme in mind: they aimed at carrying by air as soon as possible, as the normal means of transmission and without extra charge, *all* first class letter mail and postcards despatched to Empire countries on the Empire air routes.

While the basic decision was made some four years ago it has naturally taken time to put the plan into execution and it is not yet in full operation. In June of last year the scheme was inaugurated on the main African route. This February the second stage was introduced on the route to India and Malaya, as far as Singapore.

(*Turn to page 70*)



When the mailboat "Pioneer" was disabled, Northern & Scottish Airways went into action.

What Manufacturers Should Know About the

Wage—Hours Law

THE MINIMUM 25-CENT WAGE PROVISION of the wage-hour law affects practically nobody in the aircraft industry. But the 44-hour provision seems to affect many employees in most plants. Some managements are not clear on how to comply with the law. In an effort to help them, the editors wired a large number of manufacturers asking them to submit their questions to Aviation's Washington office for the best obtainable answers.

It is important first to understand the law, and the position of Administrator Elmer Andrews. The key question in everybody's mind is: Why doesn't Mr. Andrews tell everybody specifically what to do and what not to do? Here's why.

As everybody knows, the National Labor Relations Board has authority to hear cases, and finally to issue orders which have the force of law. The American Federation of Labor, and many others of like mind, deeply resented such authority. So when the Black-Connery Wage-Hour bill, proposing another such powerful board, was argued in Congress, AFL and others blocked the *board* provision. Thus the law that was enacted and is now in force, sets up an Administrator in the Labor Department who has limited powers specifically delegated to him by the Act. He can issue only certain rulings. This law is designed to be enforced largely by the court through decisions on complaints. Mr. Andrews and his legal staff can and do give opinions, but their opinions, like those of any other lawyers, can and will be challenged in the courts. They hesitate to give controversial opinions which may lead employers into trouble. They prefer to give none. They advise: When in doubt, comply. Congress, not the Administrator, is responsible for this state of affairs.

Likewise Aviation cannot be responsible in any way for these answers, though the best available information has been obtained.



Calvert Magruder is general counsel to the Andrews office and chief question answerer to several billion dollars worth of industry that wants to know how it stands with the wage-hour administration in Washington. Mr. Magruder was assistant dean of Harvard Law School and will go back to Blackstone and blackboards when he can get away.

QUESTION No. 1, now in the minds of all manufacturers, in aircraft and elsewhere: Can employers legally cut wages of employees on a work week in excess of 44 hours, and use the saving to pay time and a half overtime, thus continuing in status quo?

ANSWERS: The law says wage reductions as a result of the act shall not be justified. Many lawyers say Congress dared not, under the constitution, forthrightly forbid cutting and, therefore freezing, wages. Nevertheless, Mr. Andrews issued a ruling, based on the "not be justified" clause, that overtime shall be calculated on regular wages not on reduced wages. It is considered risky to ignore this ruling. A court order to pay retroactive overtime would be expensive.

Q. In periods of restricted plant operation it may be necessary to rearrange duties of assistant department heads so that they may not have the six listed qualifications necessary for administrative classification. In cases of doubt, would you advise placing border-line positions in the administrative group or in the group limited to 44 hours?

A. Andrews has said it makes no difference what a man's title is. The nature of his job is what counts. If in doubt, put them in 44-hour class. The definition is not iron-bound. An executive is a man who makes major decisions.



Elmer F. Andrews, Administrator of the new Fair Labor Standards Act, better known as the wage-hour law, former industrial commissioner of New York State, has surprised Washington and many labor and industry leaders by sitting in a very hot seat without getting burned. He seems to be fair minded and sincere.

Q. Does the law apply to aircraft experimental work?

A. General Counsel Calvert Magruder, in release 122, November 4, is quoted as saying, "Yes" to the above question.

Q. As our plant has been operating under the Walsh-Healey Act, are we correct in thinking that since October 24, 1938, we are subject to both the Walsh-Healey and the Wage-Hour Acts?

A. Yes, you are correct. Walsh-Healey 40-hour week takes precedence. Conflict on wages improbable, but the higher of two statutory wages applies.

Q. Are uniform procedures being worked out by any one committee, group or association within the aeronautical manufacturing industry?

A. Not that we know of. There is no reason this can't be done. The Administrator undoubtedly would rather advise large groups than small.

Q. One company intends to post regular bulletins to employees on wages hour, and asks what subject matter should be included.

A. Get all rulings and interpretations by Andrews; select only those that apply to your organization and post them with your comments.

Q. Is it not the intent of the law that wage-hour practices in any one industry (e.g., manufacture of aeronautical products) shall approximate a uniform practice for all members of the group?

A. No. In the eyes of the law each individual worker may be a separate case. Actually, of course, rulings apply to groups and conditions of workers in so far as possible.

Q. Where an employee is temporarily transferred to a salary rate (for example, an airport worker assigned to sales work) and later transferred back to wage roll, is it necessary to have a written agreement to that effect or any other special record?

A. Regulations 516 prescribes what records employers must keep. Beyond that it's up to you. Dissatisfied employee could sue you for overtime. You should have some kind of admissible evidence that the man was for a definite time acting as an outside salesman and therefore exempt from the law during that period.

Q. In a plant where, in addition to machining products which are sold in interstate commerce, similar operations are performed both in tool room and production machine shop on strictly experimental models for which there will be no sale. May the experimental work therefore be excluded from the provisions of the wage-hour law?

In reply to AVIATION'S wire offering to answer wage-hour law questions, a few firms stated that they couldn't think of any. Most wanted to know something or other. One had six or eight queries, some of which caused the best Washington labor experts to scratch their heads.

One company says it is reasonably sure it is complying with the wage-hour law, but has not made a study of the Act as yet. It wants to see AVIATION'S answers. Another says it had studied the Act, understands it pretty well, and doesn't believe the law will seriously affect the aircraft industry anyway. Airplane manufacturers shouldn't work their men more than 40 hours, says the firm's president. Still another firm, though a little confused about it all, has issued orders that all employees subject to the Act, both wage and salaried workers, shall punch clock cards. At the same time it admonishes all on a design contest job, to which limited funds have been allotted, to try to jack up their efficiency and get the regular work done in 44 hours.

A. No. Experimental work is not exempt.

Q. Where employers pay to *all* employees more than the minimum wage specified in the Act, what proportion of the shop force can be employed in a group consisting of learners, apprentices, handicapped workers and messenger boys?

A. *All* of them, if *they* don't mind. The law is concerned only where less than 25 cents is paid.

Q. Would you advocate any change in company policy with reference to vacation, sickness or other time-off allowances in view of the fact that a salaried employee is now compensated on a time-and-one-half basis for all hours over 44, whereas he would have received no overtime under a straight salary arrangement prior to October 24, 1938?

A. This is entirely a matter of your relations with your employees. The law cannot stop you.

Q. In an engineering and experimental department made up of a chief engineer and his assistant, several project engineers, chief draftsman and other technicians, would you advocate placing as many as possible in the administrative group, a professional group or in the group limited to 44 hours?

A. Put them in these exempt groups if you honestly believe they come under the Andrews definitions.

Q. Do you advocate showing certificates of compliance on invoices when requested by customers?

A. A previous processor's violation is not the responsibility of the next handler unless the latter knows about the violation, in which case, of course, he would not buy the goods. If he learned the fact after purchase and delivery, his duty is to report it and get instructions. Legal opinion is, however, that an innocent handler can be restrained by injunction from shipping in commerce goods worked on under illegal conditions by a previous handler. If a customer asks you for verbal or written assurances that your goods were produced under legal labor standards, it would seem unwise to refuse, although there is no law on this point.

Q. Do engineers come under the classification of professional? It appears to us that they qualify under the definition of the word "professional" but we are anxious to have a final ruling on our interpretation of this classification.

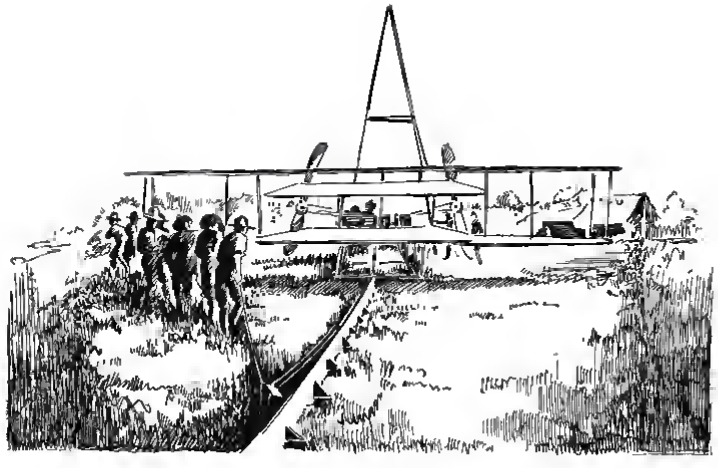
A. There is no official definition of engineers as professionals, but you are reasonably safe in assuming a court would so rule. It seems obvious that is what Congress intended.

Q. Our mechanics are at times sent out on repair jobs on aircraft located away from the plant. There is no way we can possibly keep track of their hours of labor. It has been our custom to pay them on basis of a 60 hour week instead of a 40 hour week, on the assumption that they may be required to work overtime on such occasion. On what basis should we pay these men on such occasions to conform with the terms of the Act?

A. Your plan seems approximately equivalent to time and a half. But could you convince the Administrator or a court, in case of complaint, that you could not keep their time and pay accordingly?

Q. Our chauffeurs and truck drivers very frequently go on errands before even reporting to the plant in the morning and again, may be sent on errands in the afternoon and not return to the plant until the following day and therefore,

(*Turn to page 80*)



Back to the **CATAPULT**

By Capt. Holden C. Richardson

As airplanes outgrow their take-off areas, attention turns naturally to the problem of assisted launching and the future may see us turning back to the methods of the Wright brothers to get our aircraft off the ground. In this, the first of two articles, the author discusses the background of catapulting and the forces acting on the aircraft in assisted take-off. In the second he will consider design of the catapult car.

THE ADVANTAGES to be obtained by assisted launching of airplanes are rapidly gaining recognition. They are bound to result in improved performance of existing designs and to exert an important influence in new designs.

By the use of assisted launching it is possible to shorten the take-off run without requiring the use of excessive power or the temporary over-rating of allowable power for take-off and initial climb and the use of special fuel and high compression while still attaining sufficient excess above stalling speed to insure complete and adequate control of the airplane.

The reduction in power requirements permits the use of a smaller power unit which in turn means less weight and cost or for the same gross load an increase in useful load which may be utilized in fuel for increased range or in increased payload. The smaller power unit will operate at a higher percentage of its maximum power at cruising speed which in general will result in greater efficiency of the engine which again augments the range or payload.

Ability to launch at speeds well in excess of stalling speed without excessive power also reduces the necessity of using high lift devices. (These however are desirable for emergency landing but afford little benefit for takeoff and only make the pilot's duties more onerous at a critical time.)

These advantages become proportionately greater as the degree of "assistance" is increased. To just which phases the advantages are best applied will depend on the service required. The maximum of assistance is obtained by catapulting wherein the degree of assistance takes on a major proportion and is limited only by the length of run, the desired minimum speed of launching and the acceleration to which the plane or the occupants may be safely subjected.

In a narrow sense "assisted launching" refers to external forces made available for launching land planes from the surface of the landing field or seaplanes from the surface of the water. It is not a new thought but it is only recently that commercial operations have led to its revival. In its simplest form a towline is used which is led out down wind from a fixed point to a releasable attachment on the landing gear or the float. This is reminiscent of the divided towline used by Octave Chanute (adviser to the Wright Brothers and a pupil of Lilienthal) in his glider experiments and practice on the sand dunes on the shores of Lake Michigan. Chanute used man power at first, but later proposed the use of a car on rails towed by a power winch. Towing by power winches, automobiles, tractors or by the use of compressed air, hydraulic, air-hydraulic or powder engines are among the means which have been used generally in conjunction with multiplying gear in the form of multiple sheaves. Towing a seaplane by a towline from a fixed point does not appear practicable due to the length of towline required and the high resistance of the towline catenary dragging through the water at the velocities necessarily involved.

For both land and seaplanes it is objectionable to have to "follow the line" for if speeds much in excess of stalling are desired the planes and their occupants are subject to stress due to surface inequalities from which they are spared if a launching car and track are used. Any yawing while towed may involve serious consequences.

In another form for land planes the chassis is directly attached to a towing car which follows the track. This is a better method but has the objection that a blow-out or a malfunction of the landing gear may be serious.

The "pick-a-back" method for launching airplanes was tried during the world war and has recently been revived. This method fully demonstrates the advantage of assisted launching but appears to be an extravagant method and subjects the carrying plane and its "rider" to all the disadvantages of surface take-off particularly so in all but sheltered water. It is closely analagous to "catapulting".

Langley used a spring catapult when launching his steam-engine and gas-engine models and later on a larger scale in his two unsuccessful attempts to launch his man-carrying "aerodrome".

The Wright Brothers used a monorail car propelled by a falling weight with a multiple purchase to "assist" in launching the first power driven airplane to attain man carrying flight at Kittyhawk. They continued to use this method until they applied wheels to the landing gear of their plane.

The Langley catapults had the disadvantage of applying a severe maximum force at the start of the run which faded rapidly during the run. The Wright system was more truly assisted launching than catapulting. It had the advantage of applying a substantially uniform force in assisting the launching throughout the run.

The first successful catapult launching of a seaplane was made with a catapult devised by the late Captain W. I. Chambers U.S.N. at the Navy Yard, Washington, D. C. on November 12th, 1912. A previous attempt with the same catapult at the Naval Academy at Annapolis, Md. failed because the seaplane rested on but was not attached to the launching car. As a consequence the nose of the plane lifted from the car at mid run and the plane was launched in a stalling attitude with one wing low because of a cross wind and plunged into the water.

In this catapult a compressed air engine was used with a multiplying purchase driving the catapult car and the plane at seven times piston speed. In the first launching, full pressure from the reservoir was applied to the piston of the engine before the car was released so that its action had the same defects as the spring type catapult. In the second launching the nose of the plane was held to the car by hooks which were automatically tripped at the end of the launching run. Thus they prevented release and sideway until flight speed was at-

(Turn to page 76)

Analysis of Forces—Fig. 1

T = Thrust of Propeller = $\frac{375\ E.H.P.}{V}$

$E.H.P. = B.H.P. \times V_{Factor}$ V = Velocity in Miles per Hour

W = Flying Weight in Pounds

L = Wing Lift = $C^1_L SV^2$ C^1_L = Lift coefficient. S = Wing Area (sq. ft.), V = Velocity in Miles per hour

D = Wing Drag = $C^1_D SV^2$ C^1_D = Drag coefficient S = Wing Area (sq. ft.), V = Velocity in Miles per hour

P = Parasite Drag = $C^1_H sV^2$ C^1_H = 0033 S = equivalent parasite area (sq. ft.), V = velocity in miles per hour

α = Acceleration under impulse of catapult, assumed constant

g = Acceleration of Gravitation = 32.2 feet per second per second

α/g = Number of G's as a measure of the catapult force

$M = (\alpha/g)\ W.$

R_1 = Forward reaction = force applied vertically at forward point of attachment to car

R_2 = Rearward reaction = force applied vertically at rearward point of attachment to car

R_3 = Force acting at step of float or hull. "Warming up" thus force is a restraint preventing plane from forward movement "Starting", "underway", and from "start" to "release" is the driving force applied to the step

Since the attitude of the plane is "fixed", the wing angle is fixed and C^1_L and C^1_D remain constant, throughout the launching stages

General Case $R_1 =$

$$\frac{Tn+W(b+c)-L(b+d)-(Do+Mm+Pl)}{(a+b)} \quad (1)$$

$R_2 = W-L-R_1$ (2) $R_3 = D+M+P-T$ (3)

Warming Up $L=0$ $D=0$ $P=0$ $M=0$ $T=T_0$

$$R_1 = \frac{T_0 n + W(b+c)}{a+b} \quad (4)$$

$$R_2 = W - R_1 = \frac{W(a-c)-T_0 n}{(a+b)} \quad (5)$$

$$R_3 = -T_0 \quad (6)$$

Start. $L=0$ $D=0$ $P=0$ $T=T_0$

$$R_1 = \frac{T_0 n + W(b+c) - Mm}{(a+b)} \quad (7)$$

$$R_2 = \frac{W(a-c)+Mm-T_0 n}{(a+b)} \quad (8)$$

$$R_3 = M - T_0 \quad (9)$$

End of Run. $L=W$ $D=D_0$ $P=P_0$ $T=T_0$

$$R_1 = \frac{T_0 n + W(c-d) - (D_0 O + Mm + P_0 l)}{(a+b)} \quad (10)$$

$$R_2 = -R_1 = \frac{(D_0 O + Mm + P_0 l) - W(c-d) - T_0 n}{(a+b)} \quad (11)$$

$$R_3 = D_0 + M + P_0 - T_0 \quad (12)$$

Release. $L=W$ $D=D_0$ $P=P_0$ $T=T_0$ $R_1=0$ $R_2=0$

$$M = \frac{T_0 n + W(c-d) - D_0 O - P_0 l}{m} =$$

$$T_0 - (D_0 + P_0) \quad (13)$$

$$T_0(m-n) + D_0(a-m) - P_0(m-l) = W(c-d) \quad (14)$$

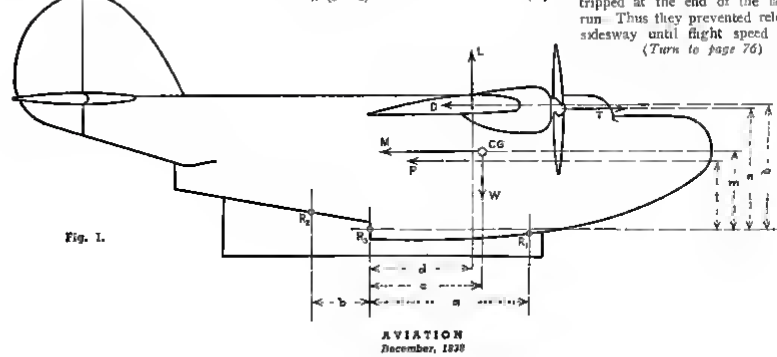


Fig. 1.

LABORATORY ALOFT



When cockpits are big enough to be called "Captains' Offices" it is possible to install elaborate equipment for flight tests.

WITH FLOOR SPACE equivalent to that of a good size business office available for the control room, sufficient test equipment for operation by several persons was installed in the Boeing Clipper's upper deck. Comfortable accommodations for six flight officers are provided for regular operation and during the test flights as many as four men with a complete array of temperature, pressure, and vibration recording apparatus were able to work efficiently in this space. Accessibility of Wright Cyclone engines made it possible for mechanics to work on them in flight and the engines could be stopped completely for service because of the full feathering Hamilton-Standard propellers.

More than 100 different precision instruments were used simultaneously, including the 58 instruments installed as regular equipment at the half-dozen posts of the various crew members.

Manufacturers tests, conducted by Test Pilot Edmund T. Allen and directed by R. J. Marshall, vice-president of engineering for Boeing, included 90 takeoffs and landings, some 450 miles of taxiing and about 5000 miles of concentrated flight testing. The program consisted of 32 distinct tests.

Following the manufacturers tests the ship began its Civil Aeronautics Authority tests and as it entered the final stage of this program the second of the fleet of six was nearing completion.



Riding on the step, just before the take-off.

The flying laboratory in the air.



In the Mail Compartment was installed Sperry-M.I.T. equipment to record vibration.



Temperature readings from 89 sources and 71 pressure readings were recorded at the "captain's desk."



A close-up of the pressure and temperature recording apparatus.



The Clipper alights after the tests.



Test Pilot Eddie Allen smiles his approval.



A week in drydock for a new paint job between tests.



Behind the Scenes with the ENGINEERS

Latest Technical Developments and Plans for Their Application Revealed at the Third National Aircraft Production Meeting of the S.A.E.

IN THREE SHORT YEARS the National Aircraft production Meeting, sponsored by the Society of Automotive Engineers, has become established as one of the truly vital annual get-togethers of he aviation industry. This year's sessions, held at the Ambassador Hotel, Los Angeles, October 13, 14, and 15, broke previous attendance records with a total turnout of more than three thousand persons at all meetings, and a registration of more than six hundred different people in attendance. Leading aviation industry people, engineers, executives, shop men and students, swarmed the sessions from the time the opening gun was fired by General Chairman C. E. Stryker, to the fall of the gavel at the banquet and grand ball Saturday evening, presided over by toastmaster J. H. Kindelberger, president of North American Aviation, Inc.

Holding of this important production meeting in Los Angeles quite properly highlights the fact that Southern California is the leading aircraft manufacturing center by quite a wide margin at the present time. The heavy turn-out of shop men and engineers was to be expected in an area where three factories alone are working against a total backlog of almost $75,000,000 unfinished business, each employing upward of three thousand persons. But in spite of this concentration of the industry in Southern California, the attendance from East of the Rockies was most generous and eleven of the thirteen papers read at the meeting were by authors hailing from East of the Mississippi. And the general content and delivery of the papers won unstinted applause from all in attendance. Even the most hard-shelled engineer was moved to open-mouthed attention by discussion of such developments as the absolute altimeter which gives to the pilot flying "on instruments" his actual ground clearance to within a few feet; the new profilometer which measures surface smoothness in units of millionths of an inch; radio controlled landing systems which make it possible for the pilot to leave the cockpit and play bridge, rummy, or pinochle with the passengers while the plane comes in for a pilotless three-point landing; the new Curtiss-Wright Dubl-Chek instrument board that literally thinks for the pilot; and any number of other developments. Those in attendance were given advance engineering and production knowledge not otherwise obtainable for many months to come.



Seated l. to r.: John A. C. Warner, Carleton E. Stryker, Frank W. Caldwell, C. W. Spicer. R. W. Palmer, Robert J. Pritchard. Standing l. to r.: E. W. Templin, Howard C. Stroup, Peter F. Roesman, A. H. Lee, K. P. Wright

From a production standpoint the rapid growth of the aviation industry was well illustraed by Mr. Kindelberger when, during his remarks as toastmaster for the closing banquet, he commented that there were as many people in attendance in the one banquet hall as had been employed in the entire Southern California aviation industry thirteen years ago when he joined the Douglas Company. C. W. Spicer, national S.A.E. president, gave a brief talk urging aviation engineers to maintain the greatest possible broadness of vision in the light of rapid technological progress being experienced. He reminded his hearers that the entire development of both the automobile and airplane had come within his own lifetime. The Hon. Clinton M. Hester, C.A.A. adminis-

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L. to r. G. J. Hausemann, J. L. Atwood, C. E. Veal



Above: l. to r. Howard Houghton, Harvey Christen



Left: l. to r. W. C. Cloyton, Richard M. Meck, F. R. Shanley, Burnham Adams

Below: l. to r. C. F. Lienesch, E. H. Heineman, Jerome Lederer, Stephen Rathe



Left to right: Hall Hibbard, A. E. Lombard, Jr., J. A. Herlihy



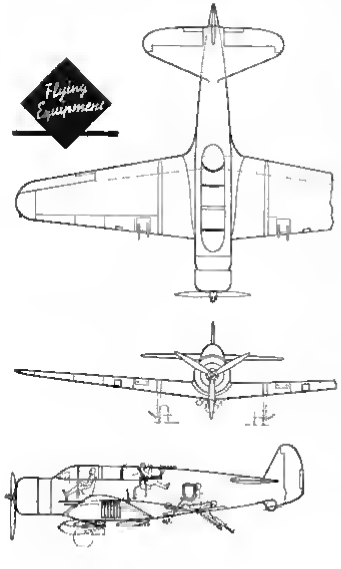


VULTEE V12 ATTACK-BOMBER

Tactical Experience Dictates Use of This Type of Equipment

IT IS WELL KNOWN that the attack, or attack bomber type, airplane was originally conceived and developed in the United States in connection with the tactical employment of this type by the U. S. Army Air Corps. Other nations considered this weapon unnecessary until faced with the lessons of actual field operations in Ethiopia, Spain, and the Orient. As a result foreign services have turned to the U. S. for such equipment.

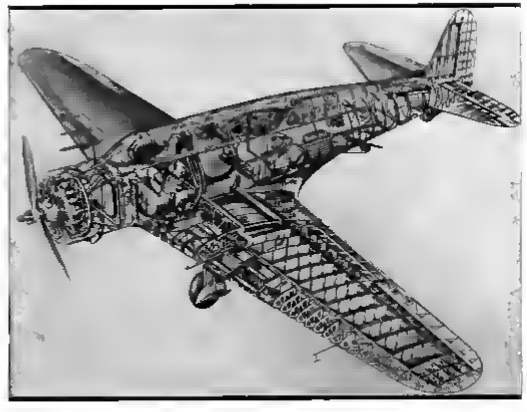
Flying Equipment



Similar to the original Vultee V-11GB in general arrangement, the V12 is of all-metal construction throughout, with exception of fabric covered control surfaces.

The fuselage, built up principally from flat sheet riveted to bulkheads and fuselage rings, is easily repaired in the field as it is only necessary to remove a damaged shell plate and, using it as a template, cut out and drill the replacement sheet, which is then riveted in place. The fuselage rings are formed on an ingenious rolling machine developed by Vultee engineers for rolling material varying from .015 dural ribbon sheet to extrusions up to ¾ in. stock. Tubing may also be rolled, either dural or chrome molybdenum, or stainless steel sections. This particular machine is an example of the production engineering reflected in the design of the V-12. The V-12 wing is of stressed skin construction built in three sections—a center section and two outer panels. Structure of the outer panels is essentially a single wide box spar with two shear webs and corrugated sheet alloy capstrips with the corrugations running spanwise. The smooth outer skin is riveted directly to these corrugated spar sheets, which are in turn supported by internal ribs. The leading edge forward of the front shear web, is quickly removable in sections, providing ready access to the entire interior of the wing structure, fuel tanks, machine gun mountings, landing gear mechanism, etc. The completely retractable landing gear is of rugged construction with unusually wide tread, making regular operation out of temporary fields entirely practicable. Retraction actuating systems of either electric or hydraulic type are optional.

Notable features of the V12, as distinct from the V-11GB, include the streamlined canopy, which fairs smoothly into the fuselage, and a new type counterbalanced gunner's seat which provides direct sighting over a wide range of firing angles. Although the standard V12 is equipped with a Wright GR-1820 G-105A engine rated 900 h.p. at 6500 ft. altitude, with 2-speed blower, it is available with numerous alternate powerplants of either domestic or foreign manufacture, as the fuselage of true circular cross-section is well suited to mounting of all types of radial engines in the 1,000 h.p. class for which this plane was designed. The wide versatility for which the V-11GB has become known is retained and enhanced in the V-12 model. Bomb loads up to 3,000 lbs. can be carried, depending upon the desired range, as illustrated in the accompanying bomb load and range table. Three forward bomb racks mounted on the center section belly, carry bombs up to 1100 lb., and each of three rear bomb racks carry up to 500 lb. Internal bomb loads are carried in a cannister installed just back of the pilot's cockpit and several alternate loading arrangements are available. The bomb release system is of marked simplicity, of mechanical type manually operated in such a way that the system could hardly be more positive if the bombardier personally leaned out and tripped the rack release by hand. The release system consists essentially of short lengths of cable from the control pedestal to a drum on each of three torque shafts, which operate respectively the forward, rear, and internal bomb racks. The system is geared approximately five to one and permits pressures of over 100 lbs. to be developed at the release. Recharging the racks is accomplished by spring loading the torque shafts so that each throw of the release lever increases tension on the spring. When all bombs have been dropped the shafts will spin back automatically to the charged position and the racks are again ready for loading. Selective and salvo control is provided in the bombardier's compartment and salvo control in the pilot's cockpit. Selective control for the pilot may be added if desired.



The pilot's armament consists of four fixed wing guns, selectively fired by an electric trigger grip control on the control stick. Charging of the wing guns is accomplished by a direct cable system and the gun charging handles are mounted at the forward left portion of the cockpit for easy access by the pilot. Two 30 caliber machine guns with 1600 rounds and two 50 caliber machine guns with 550 rounds of ammunition are carried in the wings. All fixed guns are mounted in separate wing nose sections and there is adequate room for servicing and reloading without changing the gun setting. The gunner's cockpit carries a 30 caliber flexible gun and a new type counter-balanced seat, which has been mentioned. In the bombardier's compartment, which is also designed to carry equipment for oblique and vertical photography, a rearward gun platform is installed which retracts flush with the bottom of the fuselage. Firing angles of this gun range from horizontal to vertically downward, and 45 deg., right or left. As a defensive measure against enemy pursuits, while engaged in bombing missions, this gun is of obvious merit. On attack missions the gun is a particularly effective weapon against ground concentrations as it permits attack both "coming and going."

Throughout the V12 have been incorporated features conducive to simplified maintenance of the structure and all installations.

English System

		Attack Mission	Bombing Mission	
High Speed — Sea Level	MPH	217	204	
Maximum Speed — (7,500 Ft. Cnt.*)	MPH	235	218	(Low Blower Ram)
Maximum Speed — (10,000 Ft. Cnt.*)	MPH	243	222	(High Blower Ram)
Cruising Speed — (11,200 Ft.)	MPH	211	190	(Low Blower Ram)
Cruising Speed — (15,000 Ft.)	MPH	218	190	(High Blower Ram)
Landing Speed — (Sea Level)	MPH	69	72	(Without Bombs)
Time of Climb				
To 6,560 Ft.	Min.	5 1	7 6	
To 9,840 Ft.	Min.	8 0	12 1	
To 13,120 Ft.	Min.	11 5	18 0	
To 16,400 Ft.	Min.	15 2	25 5	
To 19,680 Ft.	Min.	19 5	33 5	
Service Ceiling	Ft.	25,500	22,000	
Maximum Range	Miles	1,200	2,870**	

Metric System

		Attack Mission	Bombing Mission	
High Speed — Sea Level	KPH	349	328	
Maximum Speed — (2,190 M Cnt.*)	KPH	378	351	(Low Blower Ram)
Maximum Speed — (3,780 M Cnt.*)	KPH	392	358	(High Blower Ram)
Cruising Speed — (3,400 M)	KPH	340	310	(Low Blower Ram)
Cruising Speed — (4,565 M.)	KPH	351	306	(High Blower Ram)
Landing Speed	KPH	111	116	(Without Bombs)
Time of Climb				
To 2,000 M.	Min	5 1	7 6	
To 3,000 M.	Min.	8 0	12 1	
To 4,000 M.	Min	11 5	18 0	
To 5,000 M.	Min	15 2	25 5	
To 6,000 M.	Min	19 3	33 5	
Service Ceiling	M.	7,760	6,690	
Maximum Range	Km.	1,930	5,330**	

*Theoretical altitude with ram is the altitude at which the engine may be operated at full throttle in level flight for unlimited periods at rated manifold pressure.

**Bombs dropped when 50% of fuel load has been consumed.

Dimensions: Span 50 ft. (15.25 M.), length 37 ft. 3½ in. (11.42 M.), height 12 ft. (3.65 M.), wing area 384 sq. ft. (35.67 sq. M.).

Design Loading — Normal Attack Mission
Vultee V-12

	Pounds	Kilograms
Crew — 2 men and parachutes	400	181.6
Fuel — 250 gallons	1,500	680.2
Oil — 23 gallons	173	78.5
Radio Installation	180	81.6
Pyrotechnics	38	17.2
2 — Fixed .30 caliber guns and 550 rds. ammunition	260	118.0
2 — Fixed .30 caliber guns and 1,200 rds. ammunition	127	57.4
1 — Flexible .30 caliber gun and 600 rds. ammunition	61	27.6
2@ — 20 lb. bombs (or 50 — 1 lb.)	600	272.1
Useful load	3,339	1,514.0
Weight empty	6 602	2,991.0
Gross Weight	9,941	4,505.0

Design Loading — Normal Bombing Mission
Vultee V-12

	Pounds	Kilograms
Crew — 2 men and parachutes	400	212.7
Fuel — 494 gallons	2,964	1,347.3
Oil — 30 gallons	225	102.3
Bomb Sight	12	5.5
Radio Installation	180	81.5
Pyrotechnics	38	17.2
2 — Fixed .50 caliber guns and 550 rds. ammunition	260	118.0
2 — Flexible .30 caliber guns and 1,200 rds ammunition	122	55.5
1 — 1,100 lb. bomb	1 115	511.5
Useful load	5,526	2,511.5
Weight empty	6,517	2,962.5
Gross Weight	12,043	5,474.0

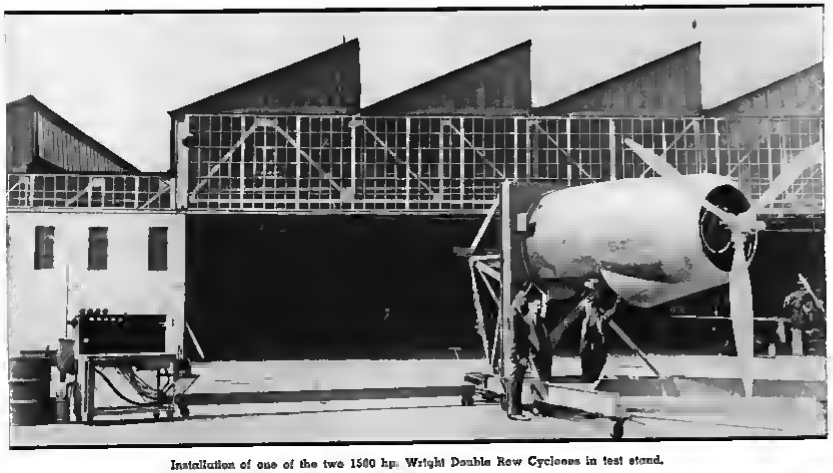
External Bomb Loadings

Bombs		Range	
English	Metric	English	Metric
(1)—1,100 lb.	(1)—500 kg.	2,092 mi.	3,344 km.
(6)—300 lb	(6)—135 kg.	1,503 mi.	2,405 km.
(2)—1,100 lb	(2)—500 kg.	1,223 mi.	1,957 km.
(6)—500 lb	(6)—230 kg.	640 mi.	1,024 km.

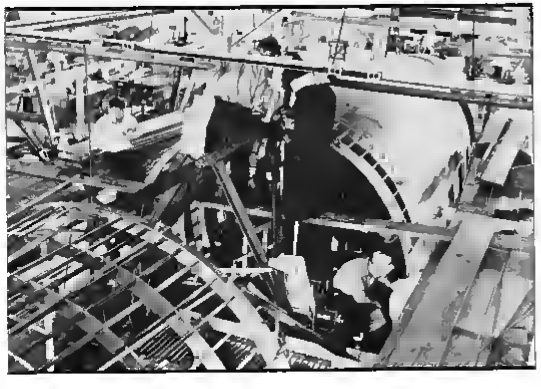
BUILDING
The CURTISS-WRIGHT Model 20

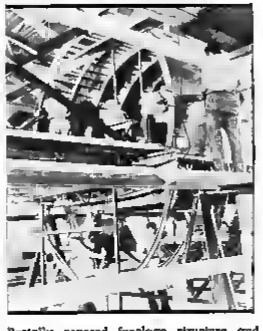
Flying Equipment

Structural details of the pressure cabin and methods used in testing the engine installation, retractable landing gear, and hydraulic system.



Installation of one of the two 1500 hp. Wright Double Row Cyclones in test stand.





Partially covered fuselage structure and details of the pressurized cabin and cargo hold.



Cabin interior showing pressure bulkhead through doorway in background.

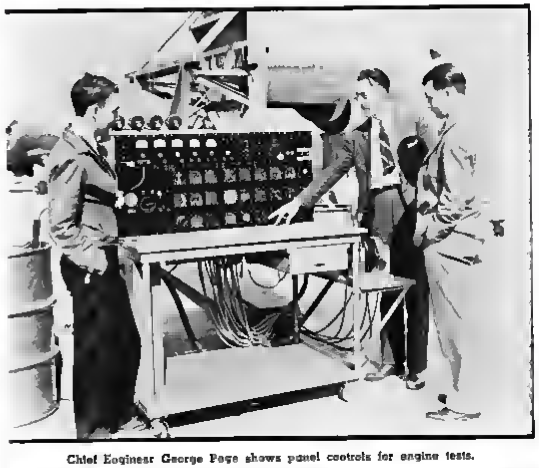


Forward part of one of the nacelles showing comparison with workman

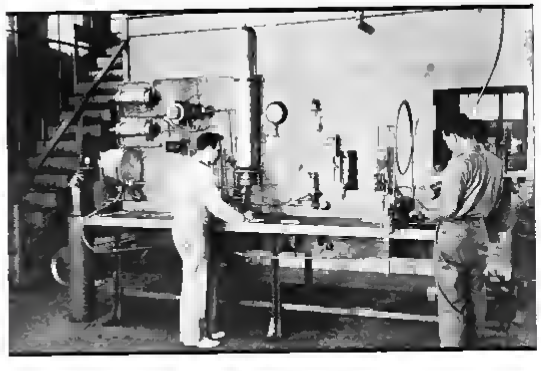
The hydraulic system is set up on a panel for tests equivalent of 10,000 hours of operation.



Retractable landing gear model and one of the 33-inch wheels.



Chief Engineer George Page shows panel controls for engine tests.





The Birdmen's Perch

Two Things-You-Probably-Forget-To-Remember

1. To send for your *free* copy of the new Gulf Aviation Atlas
2. That whopper you were going to write about Gulf Aviation Gas. Remember there's a swell specially-illustrated Diploma given every month for the best tall story. Mail your entry to:

MAJOR AL WILLIAMS alias "Tattered Wing Tips"
Mgr. Gulf Aviation Products, Gulf Bldg., Pittsburgh, Pa.

DOUBLE TROUBLE

The other day we met an old friend.

"Here's a problem for you," we said. "Two planes start at the same time from opposite sides of a 10-mile lake and head for each other's starting point. One is aided by a following wind and covers the distance 2½ times as quickly as the other, beating it by 6 minutes. How long did each take?"

"A cinch!" says he, naming both times in about eight seconds flat. "Now *you* tell *me* how fast was the wind?"

Our foil! Take a crack at them puzzles, pards, for old T.W.T.'s sake. And send in your answers before we meet that guy again!



ALL THAT GLITTERS DEPT.

You know how it is with gold. The more it is refined, the better it gets.

Same way with airplane oil. Most highly refined oil is our Gulfpride—the world's finest oil for planes! Gulf's exclusive Alchlor process—used *in addition* to conventional methods—digs down *deeper* until the 100% Pennsylvania ... removes as much as 20% more engine-fouling dirt and sludge!

AVIATION QUIZ

1. Name 5 American members of the Lafayette Escadrille.
2. Give within 100 the number of airports in operation in the U. S. at the end of 1937.
3. When was the first stratosphere flight?
4. Was the first attempt to fly the Atlantic successful?
5. What % of scheduled airline trips were actually started *and* completed in 1937?

Score 20 for each question answered right. Send your answers to T.W.T. for correction.

THIS MONTH'S WHOPPER

Dear Major:

Prexie Bill Colshaw's account of his use of Gulf Aviation gas for the curtailment of prattle dogs brings to my mind a similar instance. Being scientifically minded myself, I generally rake such stories with a large grain of salt. But his case is an exception inasmuch as it closely resembles mine, which is based on facts presented me by a very reliable friend.



Techy," my friend, was a district technical trouble investigator for a large telephone company. Suddenly his district began to be bothered with a large number of telephone replacements, the situation finally becoming so acute he was ordered to investigate.

Like a true technician he went straight to the seat of the trouble and found each one of the telephone units to be mysteriously devoid of that little pile of carbon particles necessary to convert all vibrations into electrical impulses. "Techy" tried to think of something definitely opposed to the presence of carbon deposits and the name "Gulf Aviation Gas" immediately flashed across his quivering brain.

A thorough scrutiny of conditions at the local airport revealed the astounding fact that the local pilot had such a close affinity for his one love, Aviamu- -rbar, he was accustomed to using gasoline for a *month wash!* This habit had been going on for years with ordinary gasolines, but the pilot's recent change to Gulf Aviation Gas caused his breath to raise havoc with the carbon pile in any telephone used by him . . . and he used nearly everyone's!

Technically yours **Slip Stick Armitage**

POETS CORNER

Visibility Unlimited

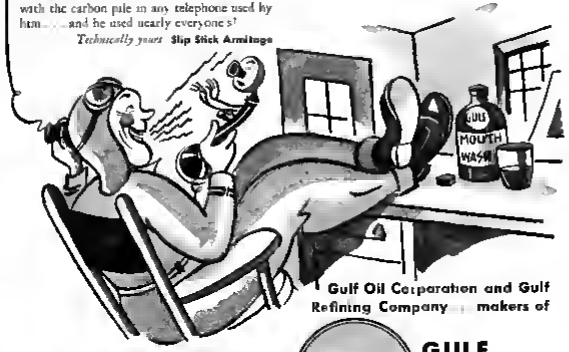
Most engineers are funny guys
This streamlined age has made them nuts
They seldom fly—just work in huts—
And tell the lad who has the guts
A ship's okay before it flies

Yes—engineers are funny guys—
They make their drawings just as though
A slide rule ought to make them go—
But how they'll run they never know
'Cause engineers are funny guys

An M.E. once designed a hack,
(The Everfly he called his dear).
It took off for the stratosphere—
Now it's been up about a year.
He wonders when it's coming back!

Most engineers are funny guys
They like to boast the bit they know—
There's one or two exceptions, though . . .
My Bosses (Sah, I need the dough!)
Are sterling fellows wondrous wise

James H. Doolin

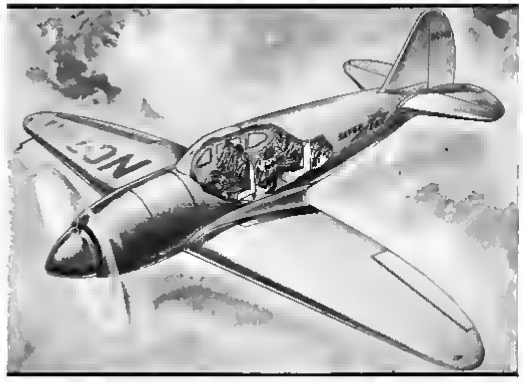


Ed. Note—Thanks for the tip! We've taken up gargling G.A.G. ourselves. Now every time the big boss sends us a pencilled memo saying "for heaven's sake, do so and so!", we just blow gently on it and the part we don't like disappears! Some fun! T.W.T.

Gulf Oil Corporation and Gulf Refining Company . . . makers of

GULF AVIATION PRODUCTS





SEVERSKY EXECUTIVE

Flying Equipment

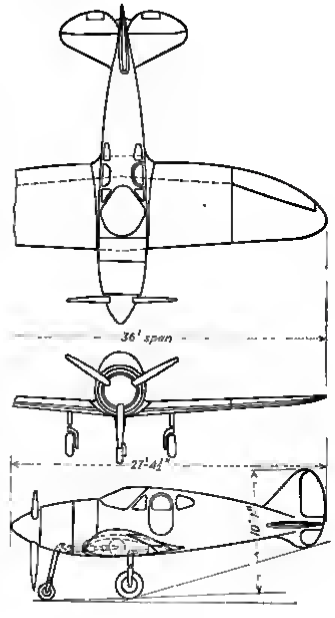
Commercial Ship with 300 m.p.h. top speed now offered

DEVELOPED through three years of study and flight tests on the initial type Seversky "Executive," an entirely new commercial "Executive" with a top speed of 330 mph has been announced by Seversky Aircraft Corporation, to meet a need for a luxury-type closed cabin airplane capable of exceeding airline cruising speeds by approximately 100 mph. Something of the performance that may be expected from the new Executive model may be judged by a study of the records established by Frank Fuller, Jr., Jacqueline Cochrane, and Maj. Alexander P. de Seversky, with the prototype airplane, a direct adaptation of the Seversky P-35 pursuit. This type airplane has won the Bendix Race for the past two years, holds the East-West transcontinental record, New York to Cuba record, women's straightaway speed record, and numerous inter-city records.

As with previous Seversky models, the new Executive will be a low wing monoplane of all-metal construction. It will incorporate a retractable tricycle landing gear and will be powered with a Pratt & Whitney twin-row 1200 hp. engine. Fowler type flaps have been included in the design to reduce landing speed, and a stainless steel skid is provided along the belly of the fuselage for emergency landings with the wheels retracted. Standard equipment will include all conventional instruments, two-way radio, radio compass, automatic pilot, de-icer equipment, etc.

Although the standard Executive is designed to take a 1,200 hp. P & W engine, any radial engine of 450 hp., or more, can be fitted. A further feature is interchangeable outer wing panels to provide a larger size for long range flight, including also the provision of extra fuel tanks in the outer wing panels. Although the first model of the new model "Executive" has not yet been tested, the following physical characteristics and estimated performances have been released by the factory:

Wing area	220 sq. ft.
Weight empty	4,890 lb.
Useful load	1,845 lb.
Gross weight	6,735 lb.
Fuel capacity	170 gal.
Fuel capacity (with large wing panels)	450 gal.
Gross weight (with large wing panels)	8,593 lb.
Engine	Pratt & Whitney R-1830-S3C-G, 950 hp. at 14,000 ft.
High speed	330 m.p.h.
Cruising speed above 13,600 ft.	300 m.p.h.
Range at cruising speed (standard)	850 miles
Range at cruising speed (extra tanks)	2000 miles
Service ceiling	26,500 ft.
Rate of climb at sea level	2,900 ft./min.





RYAN S-C for 1939

Many Improvements Feature New Warner Powered Cabin Ship

INCORPORATING a host of refinements and mechanical improvements, the 1939 model Ryan S-C all metal cabin monoplane is now coming off the production line at San Diego, Calif.

This year the already excellent forward vision from the pilot's seat has been further improved through elimination of a horizontal brace across the molded windshield, a change which also enhances the appearance of the plane. At the same time the windshield, of molded Plexiglas, has been further streamlined. The transparent sliding hatch provides complete upward vision, of special value in turns. A sliding overhead curtain has been provided for the hatch to permit protection from the sun during straight-away flight. This curtain can be instantly retracted to permit full upward vision. A further change in the hatch design is provision of louvres at the rear to provide improved no-draft ventilation for the cabin.

Structure of the Ryan S-C remains basically unchanged, consisting largely of 24 ST Alclad sheet covering over stamped rings in the fuselage, and stamped metal ribs in the wing. The wing is of monospar type, with fabric covering top and bottom in rear of the spar. Wing panels are quickly removable from the fuselage and wing tips may be quickly detached for inspection or servicing.

A year of owner operation has shown the Ryan S-C to be all that was claimed for it from the standpoint of control. Although the wing is sharply tapered, tip stall is completely eliminated through washout of incidence at both tips. The result is that aileron control remains fully effective even at stalling speeds and the plane may be flown with full control as slowly as 40 miles per hour, according to extensive factory test reports. The unique perforated belly flap, located beneath the fuselage between the legs of the fixed landing gear, has been increased fifty per cent in area, providing even more effective glide control and without noticeable stick pressure. Direct pulley cable action has now been provided for the braking system, together with a new type Goodyear unit with additional disc area. A friction brake is also provided on the tail wheel and a fairing has been provided for the supporting leg of the tail wheel.

Cabin comfort has been further improved through provision of a dual air intake system, one on each side of the cabin floor, with scoops for the airstream intake located on either side of the engine cowl and controlled from the instrument panel. As an aid to night flying all instruments on the panel are now equipped with luminous dials.

To assure that no dirt enters the intake during taxiing on dusty fields the carburetor air intake has been moved to the top of the engine cowling. A wet type storage battery may be provided in place of the dry type formerly installed, and the new battery position permits more ready access for servicing. For cold weather operation a carburetor and cabin heating unit is incorporated in the Ryan-built exhaust manifold, said to be the only Inconel collector ring now being mounted on a private owner type aircraft.

All control surfaces are of metal structure with fabric covering. Longitudinal trim is by means of a trailing edge elevator tab controlled by a conveniently located crank in the cabin. A tab, adjustable on the ground, is incorporated in the rudder. The flight instrument panel is separately supported on Lord rubber mounts. Provision is made for radio equipment, retractable landing lights and flares, in addition to standard equipment. The NACA type engine cowling is mounted with an automobile-type hinged hood arrangement which permits quick access to the engine for maintenance.

Performance figure and general data as released by the manufacturer:

Model	SC-W145
ATC Number	658
Engine	Warner Super Scarab 145 hp. at 2050 r.p.m.
Maximum speed	150 mph
Cruising speed	135 mph
Stalling speed	45 mph
Landing speed	45 mph (with flap)
Rate of climb	900 ft. per min.
Service ceiling	17 200 ft.
Weight empty	1345 lb
Useful load	805 lb.
Pay load	390 lb
Gross weight	2150 lb
Cruising range	500 miles
Wing loading	10.65 lb./sq ft.
Power loading	14 8 lb./hp.
Span	37 ft 6 in.
Length	25 ft. 5½ in.
Height	7 ft
Wheel tread	96¾ in.
Propeller diameter	82 in.
Wing area (incl. ailerons)	202 sq ft.
Aileron area	16 2 sq ft.
Fin area	5 1 sq ft.
Rudder area	6.6 sq ft.
Stabilizer area	14.3 sq ft.
Elevator area	11 3 sq ft.
Fuel capacity	37 gals.
Oil capacity	3 gals
Fuel consumption	9.5 gals per hr
Tire size	18x8-3 HD
Tail wheel size	8 in.

Flying Equipment



NORTH AMERICAN
AIRCRAFT *powered by* WRIGHT ENGINES

The new NA-44 Light Attack Dive Bomber, powered by the Wright Cyclone engine, is an outstanding military airplane, based on developments designed for the Air Forces of the U. S. Government.

The "44 Fighter", with provisions for 4 guns forward and several hundred pounds of bombs, is proclaimed the most intelligent answer to the modern need for an economical combat airplane.

Wright Cyclone engines also power all of the North American O-47 Standard Observation planes of the U. S. Army Air Corps and the National Guard. Wright Whirlwinds power the North American BT-9—the Standard Basic Type of the U. S. Army Training Center and Reserve Bases.

WRIGHT
AERONAUTICAL CORPORATION
PATERSON NEW JERSEY
A DIVISION OF CURTISS-WRIGHT CORPORATION

NA O-47



NA 44



NA BT-9







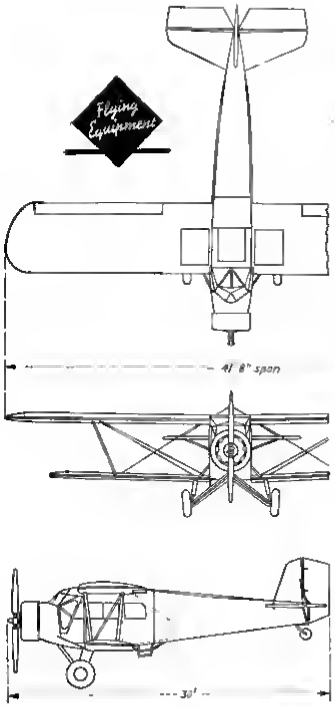
CUNNINGHAM-HALL
Freighter

DEVELOPED from the PT-6 six-place cabin airplane, the Cunningham-Hall Pt-6F light freighter will be manufactured under amended ATC 177. Provision is made for a pay load of 1128 lb. with excellent accessibility to the freight compartment for stowing all types of bulky luggage. The airplane has a high speed of 150 m.p.h. and features quick take-off and good climb, under full load conditions, to make it a practicable machine for operation from restricted areas, such as are in common use in some parts of this country, Canada, and Central and South America. The freight compartment stows 156 cu.ft. of payload in a compartment measuring 10 ft. long, 3½ ft. wide, and 5½ ft. high.

The plane is powered with a single 365 hp. Wright engine, and is of biplane design with fixed landing gear. The entire structure is metal, with fabric covering over the wings, control surfaces, and part of the fuselage.

Specifications supplied by the manufacturer are as follows:

Engine	Wright
Whirlwind R975E-1, 365 hp. at 2100 r.p.m.	
Span	41 ft. 8 in.
Length	30 ft.
Width	9 ft. 7 in.
Wing area	370 sq.ft.
Weight empty	2875 lb.
Disposable load	1675 lb.
Pay load	1128 lb.
Normal gross weight (approved)	4550 lb.
Wing loading	12.3 lb./sq.ft.
Power loading	12.5 lb./hp.
High speed	150 m.p.h.
Landing speed	50 m.p.h.
Climb at sea level	1100 ft. per min.
Service ceiling	20 000 ft.
Normal cruising range	700 miles
Fuel capacity	90 gal.

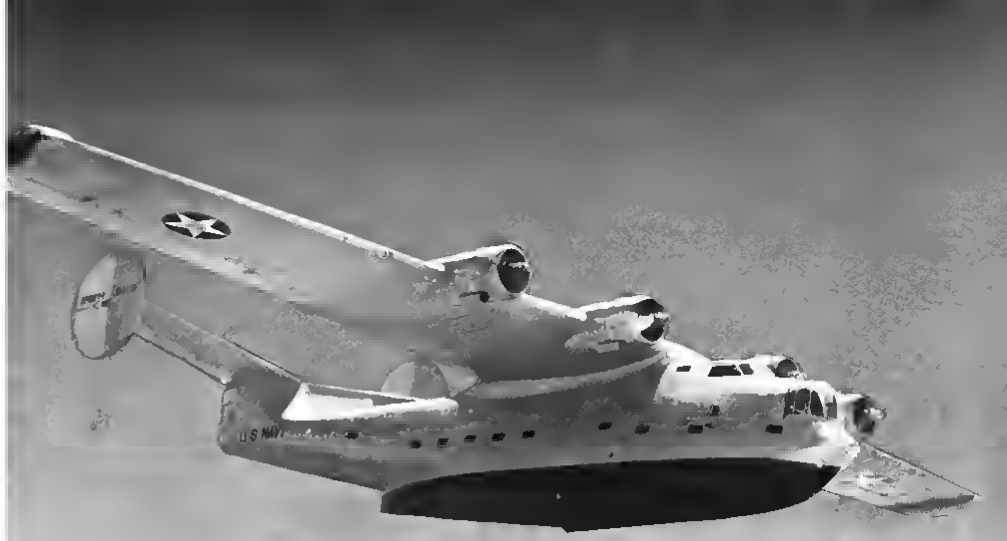


AERONCA 50 Seaplane

THE NEW 50 hp. Continental powered Aeronca has been approved as a seaplane following tests made on the Ohio river with a set of model 1320 Edo floats, especially developed for light aircraft by the Edo Aircraft Corporation. Performance figures as determined by manufacturer's tests:

Takeoff with gross load	39 seconds
Rate of climb first minute, gross load	330 ft. per min.
Top speed, gross load	91 m.p.h.
Licensed gross weight as seaplane	1256 lb.





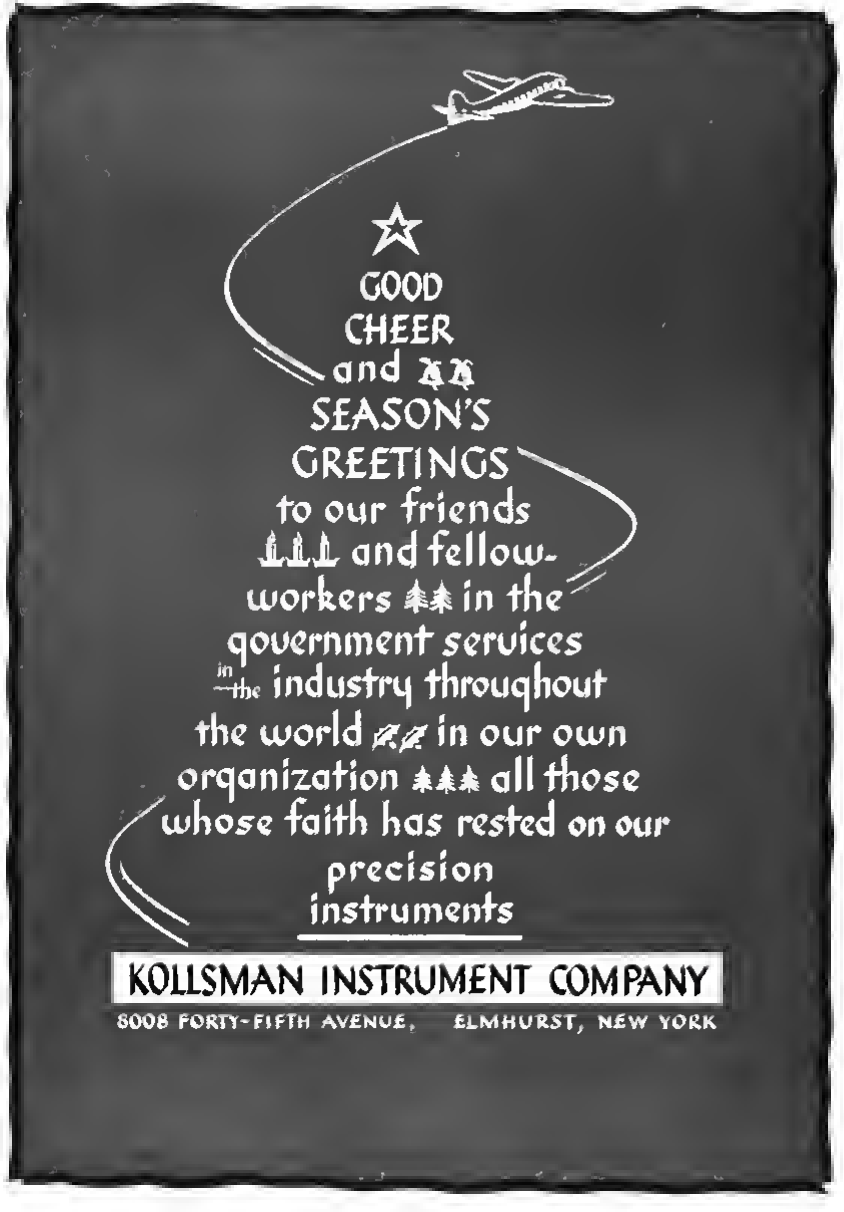
CONSOLIDATED XPB2Y-1

MORE POWER

TO (and for) THE

U. S. NAVY

CONSOLIDATED
AIRCRAFT CORPORATION
San Diego • • EST. 1923



AVIATION

RADIO

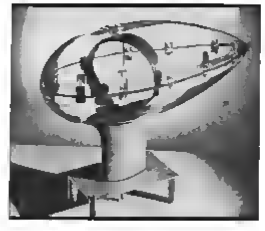
Dicing the Air Waves with Don Fink



Loops in Glass Houses

Lear Gets Plastics Award for Transparent Housing

THE THIRD ANNUAL MODERN PLASTICS COMPETITION has awarded first place in the Transport Group to Lear Developments, Inc., of Roosevelt Field for their entry a stream-lined transparent plastic housing surrounding a rotatable loop. The molding is of crystalite. While transparency in a loop housing is of doubtful utility, as such, it does produce a very pleasing appearance. Other awards, in the Transport Group made by Modern Plastics Magazine, went to the Chrysler Company for a molded glove compartment and to the Lockheed Aircraft Corporation for a Bakelite window frame of great strength and light weight.



Streamlined transparent plastic housing for rotatable loop

Beside getting themselves cited in artistic competitions, the Lear boys have been busy with their knitting. A recent announcement shows that a new Lear Radio Compass, Model ARC-6, is now available with an automatic motor-driven follow-up mechanism which at all times keeps the loop pointed at the station received. Bill Lear is also making an entry into the uhf field, having just delivered to the CAA a receiver and a transmitter designed to work at frequencies above 100 Mc. The receiver is a crystal-controlled superheterodyne (three acorn tubes and six others) for use on the 125 Mc instrument landing range work and on 141.78 Mc for local control tower research. The transmitter, a ten-watt, phone modulated outfit operates on 141 Mc and is crystal controlled.

Among the features are the "hair-pin" tuned circuits used in the transmitter, as well as the "doorknob" tube used as the power amplifier.

UHF and the CAA

Digests of Two New Reports from CAA Engineers

TWO REPORTS have recently come out of Washington which should make interesting reading for anyone who has a stake in aircraft radio. The first, Report No. 14 of the Safety and Planning Division, Bureau of Air Commerce, describes the experiments on a 75 Mc fan-type marker at the Bowie, Md., beacon. The second, issued under the new auspices of the CAA, is Report No. 2 of the Planning and Development Division, the subject of which is an ultra-high frequency receiver. Taken together, the two reports show what is ahead in the ultra-high frequency aircraft services, looking to the time when every ship is equipped for 75 Mc cone of silence, fan, and boundary-marker indications, and when, perhaps, traffic control is transferred to the ultrahighs as well.

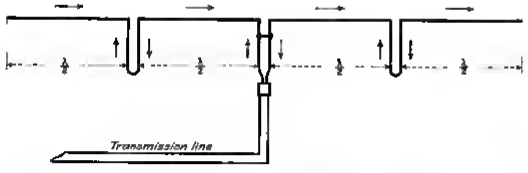
The fan marker at Bowie is described by Messrs McKeel, Lee, and Metz. The equipment consists of a 100-watt crystal-controlled transmitter, designed for unattended operation, which feeds a 75 Mc signal to a two-element antenna array, mounted above a counterpoise. The counterpoise is intended to eliminate the disturbing effects of growing vegetation and snowfalls on the shape of radiation pattern. It consists of a rectangle of galvanized wire netting, having a 3 in. by 3 in. mesh and measuring 20 by 40 feet. The wire is supported about 6 feet above the ground on a wooden framework support. The tests have shown conclusively that such a screen is an effective substitute for the ground plane and is free from the natural disturbances. The netting is solidly grounded at each support post by a heavy copper strap.

The antenna itself is shown in the accompanying sketch. It consists of rigid copper tubing, ¾ in. outside diameter, supported ¼ wavelength (3 feet) above the longitudinal center-line of counterpoise. The system consists of two half-wave radiators arranged end-to-end and fed in-phase. To insure in-phase feeding with a single transmission line, the two sections have "hair-pin" loops at their centers, the total length of each hairpin being ½ wavelength. The arrows in the diagram show corresponding directions of instantaneous current flow in the system. The transmission line is a two-conductor affair, mounted within a grounded copper shielding duct.

The transmitter employs a 4.6875 Mc crystal in a stage employing a 57 tube. The fourth harmonic (18.75 kc) is derived directly from this stage and immediately doubled to 37.5 Mc in an RK-23 tube. The 37.5 signal is again doubled in a 304-B tube to 75 Mc. Thereafter the signal is amplified in another 304-B stage, and finally drives a pair of 304-B tubes in the push-pull output stage. The efficiency of the power amplifier is 60 per cent, delivering 100 watts at 75 Mc. This high efficiency, constituting exceptional performance at this high frequency, is obtained by the use of tubes, coils, and condensers especially designed for uhf work.

The modulator employs, in addition to the 3,000-cycle, audio source, two 2A3 tubes and two type 838 tubes in class B. Two mercury-vapor rectifiers supply the high voltage power

In all, the transmitter employs 13 tubes for all functions. A simpler transmitter could be employed, of course, but in the opinion of the authors of the report, would not provide the requisite reliability for unattended operation. Two complete transmitters are contemplated for each installation, equipped with automatic change-over devices to supply uninterrupted service in the event of the failure of either transmitter.

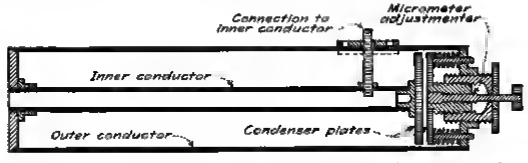


Antenna system used in the fan marker at Bowie

Flight tests performed on the installation have indicated highly satisfactory performance. The ship, the BAC NS-31, was fitted with a half-wave horizontal dipole antenna and a type RUD fixed-tuned 75 Mc receiver. Graphic records of the output of the receiver were kept on a recording milliammeter. The receiver sensitivity was such that a 30 per cent modulated signal of 1,300 microvolts was sufficient to close the indicating circuit. The radiation pattern was investigated at altitudes from 3,000 to 11,000 feet. The thickness of the pattern (as measured by the indicating signal light in the receiver output) was shown to vary from about 2.5 miles at 3,000 feet to something over 4 miles at 10,000 feet. The width of the pattern (at right angles to the course) varied from about 10 to about 15 miles in the same range of amplitude. While no data are available for heights above 11,000 feet, the fact that one of the minor lobes in the pattern did not disappear until about 10,000 feet gives a clear indication that the main lobe extends well into the stratosphere, and consequently may be employed at any altitude of flight now contemplated.

The second report, written by P. D. McKeel, describes a superheterodyne receiver suitable for use on any of the ultrahigh frequencies assigned to aircraft use. Since such assignments cover parts of the range from 60 Mc to 132 Mc, a very serious design problem was presented in the tuned circuits of the receiver. The receiver was intended for development work, rather than for routine operation, but it was built to have all the stability, sensitivity and selectivity required of commercial apparatus. The specifications are briefly as follows: tuning range, continuous from 60 to 132 Mc; selectivity, 60 db down for image frequency; sensitivity, 6 milliwatts output from a 30 per cent modulated 5 microvolt signal; band-width, 150 kc, stability, no detuning of circuits after initial warm-up period.

The tuned circuits are not of the conventional coil and condenser variety, since such circuits have low, and decreasing, Q at high frequencies. Instead, coaxial circuits, having the shape shown in the accompanying diagram, are used. By the proper choice of the metals in this assembly (aluminum alloy for the shield, copper for the inner conductor) a very high degree of stability with respect to temperature changes and vibration was obtained with a minimum of weight. Tuning of the circuits is accomplished by a micrometer adjustment of the tuning condenser at the end of the coaxial system. This micrometer system is carefully designed to avoid backlash and to give a dependable frequency calibration.



Cross section of coaxial line tuned circuit showing detail of micrometer tuning condenser.

The heterodyne oscillator presented a special problem, inasmuch as the received bandwidth is roughly 0.2 Mc as against an oscillator frequency of roughly 100 Mc. A capacitor change of as little 2 microfarads in the plate circuit of the oscillator was sufficient to throw the receiver out of tune. Five different type of oscillators were tested before the final design was decided upon. As in the r-f circuits, a coaxial tuned circuit is employed in the oscillator, tuned by a single micrometer adjustment.

The tubes in the r-f, mixer and oscillator sections are of the acorn variety. A 954 is used as the r-f tube, a 955 as oscillator, and a 954 as converter, tuned by three coaxial circuits, each with a separate tuning adjustment. The i-f amplifier employs two 6K7 tubes with automatic gain control (which may be switched in or out of the circuit at the operator's will) and three i-f transformers with a mid-frequency of 5.5 Mc. A 6Q7 tube serves as the detector and first audio, and a 41 as the output tube. The heaters of the tubes are so arranged that series or parallel connection can be made, for 6 or 12 volt operation.

The coaxial tuned circuits are of fairly large size (about 8 inches long) compared with more conventional circuits but their stability and efficiency are vastly better. Flight tests with the receiver have shown, moreover, that the coaxial type of circuit is practical in aircraft work. Early fears have proved unfounded that of the acorn tubes might have a short life.

The overall performance of the receiver shows a sensitivity of 5.5 microvolts, and shows that the limit of reception is the fundamental one of tube noise in the receiver. Although the freedom from drift with temperature is not all that might be desired in the extremes of the frequency range, over the greater portion of the range it meets the original specification. Further stability may be obtained by separating the compensating and tuning function in the capacitors in the coaxial circuits, a method which would not involve too great constructional complications.



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DOUGLAS

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Buyers' Log Book



What's New in Accessories, Materials, Supplies, and Equipment

Radio-Meteorograph

Ascends 12-15 Miles by Balloon and Descends by Parachute

OF BASIC VALUE to all weather forecasting work is a knowledge of upper-air conditions over the broadest possible area. A recently inaugurated study of stratosphere weather by the U. S. Weather Bureau, provides for daily upper-air investigations at Nashville, Tennessee; Fargo, North Dakota; Omaha, Nebraska; Oklahoma City, Oklahoma; Oakland, Calif.; and Sault Ste. Marie, Michigan.

Key to upper air weather is the Radio meteorograph, a 2-lb instrument sensitive to changes in air pressure, relative humidity, and temperature and able to broadcast this information back to a sensitive radio receiver at the airport station, from which the instrument is released. Carried by a small balloon, the radio-meteorograph ascends to a height of 12 to 15 miles, at which point the balloon bursts and



Instrument case and reward notice.

the instrument descends by parachute. A standing reward of $1 is paid for every instrument returned, directions being printed on the instrument case, and for return of instrument bearing certain pre-selected serial numbers rewards of $5 to $20 are made. The instruments are the development of Julien P. Friez & Son, in conjunction with the U. S. Navy and the U. S. Bureau of Standards. They are leased to the Weather Bureau for a period of one year, during which time the manufacturer maintains and calibrates them.—AVIATION, *December*, 1938

Standby Lighting

Lights Inc. Develop Compact Battery Equipment for Emergency Use.

MILITARY AIR FORCE OPERATIONS frequently require organization of emergency airports at points where there are no airport facilities. A prime requirement is adequate lighting for night operations, including marker lights, beacon lights and signal lights. Such needs are also occasioned in connection with various types of civil or commercial aircraft operation. To meet the problem a complete field lighting unit, portable by air, has been developed by Lights, Inc., of Los Angeles, Calif. Light's engineers have borne in mind the fact that the majority of outlying landing fields will not be adjacent to electric power supply sources, and have designed the equipment for battery operation.

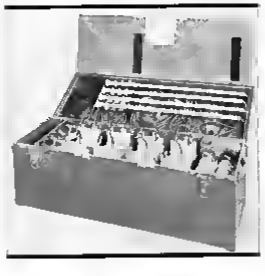
The system consists of twelve boundary marker lights, eight obstacle lights, one rotating beacon and a portable generator with a cranking battery, which may be used to operate the beacon independently of the generator, if desired. All batteries of Exide Air Corps or Renu type, are carried in sealed containers provided with a charging jack which makes it possible to recharge the battery without removing it from the container. The boundary light is provided with clear, green, or red glass hood, as specified and is attached directly to the battery container. The obstacle light is mounted on a telescopic column with a range of 3 to 10 ft., and is equipped with fifty feet of conductor cable. The rotating beacon is a double-headed unit, 180 degrees opposed, and 8 in. in diameter. It is adjustable through an elevation of two to five degrees.

Spirit levels are mounted on top of the beacon motor drive housing, to assure a proper horizontal setting. The beacon is mounted on a telescopic tripod. An engine generator is used for extended operation of the beacon, and for recharging all batteries of the system. This unit is composed of a Pioneer generator with Briggs & Stratton gasoline engine. A panel board is mounted on the generator and contains the variable resistance, ammeter, voltmeter, and three outlets, providing for the beacon, charging feeder and cranking battery. An air

(*Turn to page 49*)



Two of the four carrying cases containing complete emergency lighting equipment.





. . . SAYS A WACO DEALER

● "Your performance figures are too conservative!" Every now and then, one of Waco's dealers raises this complaint. "You make it hard for us to sell competitively!"

Waco doesn't intentionally understate facts . . . Waco simply avoids overstatements in an effort to stick to the truth!

For 16 years, Waco has done business honestly—has kept faith with dealers and customers by delivering airplanes that perform as represented—*or better*. Today's Wacos need offer no apologies when all-around performance is *fairly compared* with other ships—and Waco does not propose to begin making exaggerated claims now—*or ever*—because of competitive practices.

Our best friends are those customers who feel that their Wacos exceed our performance claims. Our most likely prospects are those who insist upon point-for-point comparisons—stop-watch and all. Waco's quiet cabin and effortless flight reduce the sensation of speed . . . yet *thorough tests win many performance purchasers.*

Your local dealer will gladly demonstrate.

WACOS MAY BE PURCHASED ON TERMS

WACO AIRPLANES

THE WACO AIRCRAFT COMPANY, TROY, OHIO

MODEL N—The world's safest and easiest-to-fly sedan type airplane. Tricycle landing gear



MODEL S—Greatest passenger-mile value. Four or five place cabin. Wide landing gear



MODEL C—Outstanding performance—roomy seats for four or five—luxurious appointments



SAFETY TO THE 'NTH DEGREE . . . LUXURIOUS COMFORT . . . OUTSTANDING PERFORMANCE

"NORMA-HOFFMANN"
PRECISION BEARINGS



for

AIRCRAFT CONTROLS

Identified with the aircraft industry from its earliest days, NORMA-HOFFMANN pioneered many of the important bearing types now accepted as standard in aviation practice. * * * * Today, almost every representative builder of aircraft, engines, instruments, and equipment—including the United States Government—employs NORMA-HOFFMANN PRECISION BEARINGS to insure safety and long, uninterrupted service. * * * * Typical NORMA-HOFFMANN Aircraft Bearings are here illustrated. Write for the general Engineering Catalog which describes 108 distinct series embracing over 3000 sizes—a PRECISION BEARING for every load, speed and duty.

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U.S.A.

PRECISION BALL, ROLLER AND THRUST BEARINGS

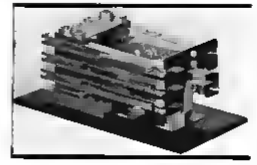
(Continued from page 46)

traffic control projector may be used in conjunction with the panel board, when traffic is heavy. The entire system, consisting of engine generator and panel board, revolving beacon, ten boundary lights, and necessary obstruction lights, is fitted into four compact carrying cases to facilitate handling and stowing.—AVIATION, *December, 1938*

Cinema Aviation Relay

Movie Firm Develops Light Weight Unit for Aircraft

AS THE SCIENCE OF AERONAUTICS ADVANCES, we find there are more and more problems which can be solved by engineers specializing in other fields, such as sound control vibration control, electrical engineering, etc. A vital link in aircraft electrical systems is the relay by which operation of various units is effected. A line of electrical relays designed especially for aircraft use has been developed by the Cinema Engineering Co., of Hollywood, Calif.



Cinema Engineering Co. Aviation Relay

These relays feature light weight, fool-proof operation and the widest possible adaptation to varying conditions of current and high or low frequency. The relay illustrated weighs less than four tenths of a pound. The coil operates on 400 cycles A.C. 1 amp. at 8 volts, 6 pole single throw 5 amp. contacts. The relay operates in less than four cycles, or one-hundredth second.—AVIATION, *December, 1938*

H & K Generator

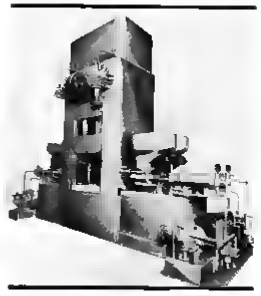
37-lb. Unit Useful for Airport and Emergency Installations

A LIGHTWEIGHT portable by air, engine generator unit possesses many applications in the aviation field, especially in connection with emergency operations, military operations, and on small airports where no power source is available. For such use the Heintz & Kaufman type 300 engine generator, manufactured and sold by Heintz & Kaufman, Ltd., of South San Francisco, and exported by Aviation Equipment & Exports, Inc., New York, is proving ideal. The H & K generator weighs but 37 lbs., is of rugged construction and features use of only three moving parts in the engine generator unit.—AVIATION, *December, 1938*

Champion M31S

Corona Free Unit Now Available for Commercial Market

RELEASE of the "Corona-proof" Champion M31S shielded spark plug to the commercial market has been announced by the Champion Spark Plug Co. For the past year this plug has been produced under exclusive contract for the military services. Said to be the only spark plug yet developed that is completely free of corona effect, the new Champion sells at a nominal price. According to Duane Stranahan, of the Champion Spark Plug Co., Corona is the electrical current leakage within the mica insulator and paralleling the center electrode. The result is a definite current loss detrimental to efficient operation.—AVIATION *December, 1938*



Model 500 Injection Molding Press

Molding Press

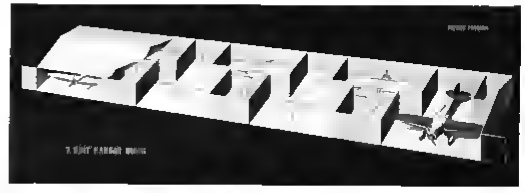
Plastic Window Frames and Ornamental Equipment Can be Turned Out by New Unit

AS APPLICATIONS OF PLASTIC MOLDING to aircraft manufacture increase it seems likely that aircraft manufacturers will install plastics departments. Of special interest to aircraft manufacturers is Model 500 Hydropower Injection Molding Press offered by the Hydraulic Press Manufacturing Co., Mount Gilead, Ohio. This unit has a total of 32 ounces injection capacity per shot, which provides for molding by the injection process some of the larger items used in aircraft, such as window frames and ornamental moldings.—AVIATION, *December, 1938*

Pre-Fabricated Steel Hangar

Any Number of Dovetailed Units Can be Built and Privacy Preserved

AN ADVANCED TYPE pre-fabricated all-steel airplane hangar, of special merit for small airports where rental costs must be kept at a minimum but privacy of storage is desired, has been introduced by Edwards Iron Works, Inc., South Bend, Indiana. Developed through the cooperation of Charles R. Bowers, veteran pilot and airport manager, and W. Howard Edwards, engineer and manufacturer, the Edwards hangar provides for dovetailed hangar units with planes nested tail to tail, doors being located on opposite sides of a long multiple hangar which may include any number of individual storage units. The manufacturer claims low first cost for the hangar, low maintenance, completely fireproof construction, with high resistance to windstorm damage, ease of erection and ease of portability if necessary to move.—AVIATION, *December, 1938*



Edwards 7-Unit Multiple Hangar

MEN *"in the know"*



KNOW *Roebling Control Cord*

THE increasing speeds and gruelling tactical requirements of ships built for today's National Defense Program make greater demands on both the pilot and his controls.

By building Control Cord to meet these new Army and Navy specifications, Roebling maintains its place as standard equipment on the vast majority of planes built for this severe service.

Send for a copy of our booklet on Roebling Wire Aircraft Products. They are made in Stainless Steel and High Carbon (Tinned or Galvanized) Steel. They include: Aircraft Wire, Aircraft Strand, Aircraft Cord (6 x 7, 7 x 7, 7 x 19), Ferrules and Thimbles, Serving and Locking Wires, Control Strand and Casing, Compressed Fittings for Attachments, Tower and Lighting Cable, Welding Wire.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, N. J. *Branches in Principal Cities*

KEEPING PACE WITH AN INDUSTRY WHOSE WATCHWORD IS PROGRESS

THE AVIATION NEWS

REVIEW COMMENT FORECAST

DECEMBER 1938

DANIEL SAYRE
C. F. McReynolds, *Pacific Coast*
Blaine Stubblefield, *Washington*
E. R. Lockin, *New York*

President Will Ask 7,000 Planes

(Story on Page 53)



Photos by Ka vanagh



FLIGHT OF THE YEAR: Nov. 5 these three Vickers Wellesley bombers lifted off the Royal Air Force field near Ismailia, Egypt. On the morning of Nov. 8 all three were at Port Darwin, Australia, 7,152 miles from the point of take-off. Two had made it non-stop. The third, running low on gas, paused briefly at Koepang, 6,600 miles from Ismailia. All three thus beat Russia's record of 6,306 miles set last year. At the right are the two men most responsible for the flight's success—Squadron Leader R. Kellett, who commanded the three planes, and Wing Cmdr. D. R. Gayford, D.E.C., A.F.C., in charge of preparations.

SPOT LANDINGS ON THE MONTH'S NEWS

Safety, Youth, Giros, Records and Airships Top Month's News

Safety Boardman Sumpter Smith has issued a very interesting progress report of the organization of the C.A.A.'s Air Safety Board. After rehearsing the duties assigned them, by the Civil Aeronautics Act, he explains that the Board has organized itself into three divisions: Investigation, Recommendations, and Information & Publication. The Investigation Division in turn is broken down into Investigation Section and an Examiners Section. The Recommendations Division consists of an Analysis Section and a Technical Section. The third division has an Information and Statistical Section and a Liaison Section. Already key positions have been filled, and the personnel list seems to us to include some first-rate talent. Included are W. S. McDuffee from Fort Worth; Louis R. Inwood from Los Angeles; Derrell T. Lane, Salt Lake City; Fred M. Glass of St. Louis; and Robert D. Hoyt from Clearwater, Fla. No third member of the Safety Board itself has yet been named.

Credit the late Frank Hawks with the inspiration and impetus which led to the establishment of "Air Youth of America" by young Winthrop Rockefeller. The basic idea behind the project is that America has fallen far behind other nations in the aeronautical education of our youth. Germany, Italy, and Russia, for example, begin fostering interest in aviation among their boys and girls almost from the cradle age. The first task AYA will undertake is a survey of what is going on in this field in the United States. Then it will decide how best to coordinate what scattered efforts do exist and augment it with or without governmental assistance. Testimony of the quality of the effort is seen in the makeup of its committee. Besides Rockefeller, the list includes William Enyart of the N.A.A., Major Lester Gardner of the Inst. of the Aero. Sciences, Grover Loening, Jacqueline Cochran, and Major E. E. Aldrin. Ernest Gamache is serving as acting director.

200 m.p.h. giros were called a distinct possibility at the First Rotating Wing Aircraft Meeting held at The Franklin Institute late in October, by Dr. George W. Lewis of the N.A.C.A. The meeting was well attended by what is probably the most brilliant group of rotary wing exponents ever to assemble. Chief topics of discussion were of course the Breguet and Focke-Wulf helicopters and Raoul Hafner's gyroplane. Among leading speakers were Representative Frank Dorsey, backer of the bill which led Congress to appropriate $2,000,000 for rotary wing developments in the last Congress; Edward J. Noble of the C.A.A.; E. Burke Wilford of the Pennsylvania Aircraft Syndicate; Larry LePage; Dr. Alexander Klemin of N.Y.U.; Consulting Engineer H. Platt of New York, and Rochard H. Prewitt of the Kellett Autogiro Corporation. But there were at least a dozen other worth while speakers on various related topics.



International

LT. COL. MARIO PETTZI
Pushed record to 10½ miles.

Records for records sake don't always thrill us as much as they might, but recent bulletins from Europe report three new marks for aeronautical achievement which make our mouths water. The first, of course, was the flight of the British Mercury Maye combination which got the upper component (Capt. D. C. T. Bennett commanding) from Dundee, Scotland, to Alexander Bay, Orenge River, South Africa. That missed the all-class distance record but set a new mark of 6,045 miles for seaplanes. The second was Lieut. Col. Mario Pettzi's altitude climb over the Guidonia airport near Rome to 56,016.64 feet. That beat the late Squadron Leader Adams' record by more than 2,000 feet. His plane was a special Caproni biplane with a small supercharged cabin, powered with a Piaggio engine. The third record seemed to us to be one of the best ever achieved in aeronautical history—the flight of the three R.A.F. Vickers-Wellesley bombers from Egypt to Australia, (see pictures on page 51). The fact that all three planes broke the existing Russian record by a substantial margin, although one was forced to refuel in the Netherlands West Indies, is an excellent tribute to the ingenuity of B. N. Wallis, who developed the geodetic type of structure used throughout the construction of the ships. But there are other interesting details. The Bristol Pegasus engines used 100 octane fuel. Bomb-racks and other military gear were of course removed and replaced by extra fuel tanks. In fact, the ships took off with gross loads of 19,000 lb., some 6,000 more than the normal rating. Each machine carried 1,250 gallons of fuel.



Wide World

NUMBER TWO: The second Boeing 314 moves outdoors for final assembly.

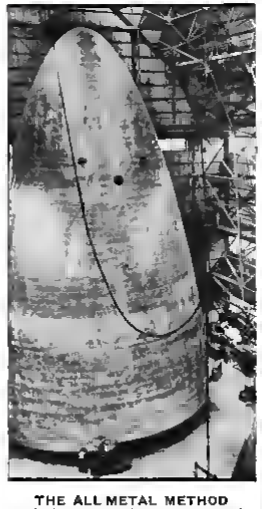
There's going to be an airship built for the U. S. Navy. After weeks of holding the matter "under advisement" the President last month announced that bids would be asked "in the near future" on the first rigid airship to be built in this country since the Macon. With $3,000,000 already appropriated for its construction by the last session of Congress, the new ship will be of 1,000,000 cu.ft. capacity and 325 ft. long. That's less than half the gross of the old Shenandoah and barely a seventh as big as the Akron and Macon. In fact we must thumb back through our histories to Germany's Nordstern and Bodensee built in 1916 before we come upon any rigids as small. But it will be large enough to demonstrate modern progress in airship technique; large enough to justify keeping the Navy's expert lighter-than-air personnel together; large enough to remove the reproach that we are doing nothing with the world's supply of helium beside hogging it. The moderate size may, in fact, lead to very interesting things. Definitely 1,000,000 cu. ft. is well within the range of the all-metal design technique which produced the Navy's highly successful 200,000 cu. ft. ZMC-2. If the proponents of this type win the contract from more orthodox builders there will be something new on the aeronautical horizon. If they don't, we are at least assured of a gem of the frame-skin and cell type.

D.S.



Wide World

ONCE OVER: President Roosevelt looks over a line up of Army and Navy types.



THE ALL METAL METHOD
Will it build the Navy's next ship?

President Plans Huge Air Program; Will Ask Congress for 7,000 Ships

THE BIGGEST AVIATION STORY in the 20 years of this country's history began piecing itself together in Washington dispatches last month—the President, so runs a dozen bulletins, will ask Congress next January for authorization to put American air strength on a par with any task that might conceivably face it, including the enforcement of the Monroe Doctrine and the inviolability of Canada. Specifically the most consistent picture of the President's plans calls for an enlargement of the Air Corps to an ultimate strength of some 7,000 planes with the Navy presumably built up concurrently to its allotment of 3,000 set by the framers of recent Big Navy plans. Since our present strength in both services together is slightly under 3,000 modern planes, this represents an increase of 7,000. Until some indication comes from the White House of the time factor in the Presidential mind it is next to impossible to forecast the influence of such a program on the development of the aeronautical industry. As AVIATION points out editorially (on page 16) the thing may as well wreck us as make us. There is no doubt however that every single phase of America's aerial activity will be deeply affected. Meanwhile here are winds-aloft reports from some of the frontal areas:

Permission—The Navy is already authorized by recent Congressional action to acquire up to 3,000 aircraft although so far it has not modified its procurement policies from the previous program calling for 2,000 planes by 1940. The Army—or at least as we have all presumed—is authorized by the legislation that followed the Baker Board report to expand up to 2,230 planes. Now, the Army and Navy Journal reports that a careful re-reading of that Act shows it was an authorization for an increase (above 1,800) by 2,230. No matter what the exact letter of the law may be however, it is likely that the Air Corps will seek an increased authorized strength of at least 2,000 planes early in the next Congress.

Appropriations—Authorized strength of course means little without backing from Congress in the shape of good, hard cash. As far as the procurement of the aircraft themselves goes, how much the President will ask for this winter will depend entirely on the time factor he arrives at. There has been talk that he will seek to almost double this year's current billion-dollar defense budget. There have been reports that he will seek to divert a large part of this increment from the relief funds for which he already holds a "blank check". Most observers, however, watching the President's close cooperation in his planning with the heads of the Army and Navy, think he will go direct to Congress for completely new appropriations, for the bulk of near future armament purposes at least. Probability that Congress will give him substantially what funds he asks for is indicated in the recent Gallup poll (which has been so accurate of late that the politicians practically set their

(*Turn to page 65*)





AVIATION IN WASHINGTON

by BLAINE STUBBLEFIELD

More and More, Work Piles Up for C. A. A.

International air relations is regarded as No 1 concern of CAA this month Grant Mason, who has arrived in Washington from the Brussels air law conference and a look around Europe, is writing a report which he will hand in probably by December 1. Mason's report will touch upon broad and important matters such as air competition on world trade routes, relative aircraft production, all deeply involving national policy. It will go beyond CAA to the State Department and to President Roosevelt, who has turned from his election setback to give his attention to a great armament program.

CAA's work schedule. (1) Initiating the WPA-PWA-Army Engineers CAA Washington $9,000,000 model airport. (2) Going ahead on national airport survey. (3) Studying financial condition of airlines; find two or three making profit but industry in dark red. (4) Going ahead on traffic control centers as extra precaution for winter safety. (5) Organization of Authority, absorbing old Bureau of Air Commerce, is done with completion of Safety Board setup. (6) Next year's budget, something over $30,000,000 has gone to Budget Bureau which has held hearings; this doubles old civil air cost and the industry may have to defend CAA in Congress on ground its burden doubled. (7) Feeder system, though experiment now under Post Office, will be kept alive by public demand and CAA cannot dismiss it.

Air Express will be news again, after ten years of service under contract between Railway Express Agency and the airlines. Persons of standing in the air express field are conferring with the Civil Aeronautics Authority on possibilities of a new deal for air parcel service. Air express never approached the volume originally expected, and recently has been falling off. Some say lack of promotion is the cause. Railway Express gets only 12 per cent of revenues, reportedly makes no profit, and is not enthusiastic about continuing to shunt business away from its parents—the railroads.

Three Air Express possibilities: (1) Continued service under revised contracts between the Express Agency and the airlines; (2) an independent air express corporation which would institute its own pickup-delivery; (3) air parcel post using Postoffice pickup-delivery. Neither the airlines, the Express company, the Postoffice nor the air Authority is quite ready to make a conclusive move, but it will come. Incidentally Pan American Airways, which depends a lot on air express to round up its parcel cargo for South America, is very much interested.

Educational orders, a War Department program, authorized by the last congress for purchase of critical munitions through "negotiated bids", will soon add airplane development as a seventh item on its schedule for this year, according to manufacturers visiting town. Objective of the project is to "educate" highly competent firms, through actual experience, in difficult but vital jobs. The aircraft project, if it is authorized, would be to find better assembly line methods in production of training planes. It is talked about town that the Stearman basic design will be used, and that the matter of compensation to Stearman is being discussed; contracts presumably would go to several firms. This is all new ground to the War Department. Congress appropriated $2,000,000 a year for five years. If the plan works, more money will be forthcoming.

All first class mail overnight, discussed elsewhere in this issue, is simmering again. Such service (all first class over 500–600 miles to be flown) would involve re alignment of the present rate structure, cargo facilities of the airlines, and the whole Postoffice setup. It would result in major change of business and social habits of the country. Civil Air Authority will give it a place in its already over-stuffed "for attention" folder. Important development is guessed at one to five years.

Foreign aircraft competition will be bad news eventually for American manufacturers. For years after the war, due to enterprise, good design, and productive capacity (while other nations were up to capacity in defense) the United States has been a principal exporter of aircraft, despite its high wage standards. But if Europe keeps the peace, some observers say Germany, for one, will start driving for world markets to take up her enormous production. Others think that the armament race will go on and that none of the fighting cocks will ever have enough airplanes. Japanese, German, and Italian wage differentials would be hard to meet, if they go in for export.

Now the Du Ponts have their eye on air transport. They are backers of All American Aviation Inc., Baltimore-Morgantown (W Va.), which has the Postoffice mail contract for experimentation with Dr. Adams' "air hook" pickup device. Postoffice officials are not very hot about it; they are merely carrying out the law passed last session. But Du Ponts are reported visualizing an extensive system of short-line mail and express routes, operating (without airports) from in-town pickup and drop stations. They have done some rate calculating, and are optimistic. These boys are not noted for calculating wrong.

Newest question-answer game is right here in the wage-hour administration. Industry asks the questions and Administrator Elmer Andrews doesn't answer them—because congress didn't authorize him to. Quite a few aircraft builders have come to town trying to find out whether engineers are professionals, whether foremen are executives, etc. There is but one thing to do: when in doubt, comply with what you think the law means. Both business and labor men here think Andrews is a fair minded man, and Andrews himself says he has a lot of patience with honest mistakes. He might be short-tempered with deliberate evasions. His only power is to haul offenders into court. Any complainant can bring charges. Penalties are severe.

Something FDR can do about the weather, say transport men here, is appoint a highly competent chief of the Weather Bureau to succeed Willis R. Gregg who died recently. They want the rare combination of a good scientist and a salesman who can wheedle pittances out of Congress. Senator Royal S. Copeland, who also died, was Weather's champion. Last year Weather lost half of its increase awarded by the Budget Bureau. Cause of the trouble is a long story. If it keeps up there will be more agitation to take the Weather Bureau out of the Department of Agriculture.

A bureaucratic boondoggle is what impolite skeptics are calling CAA's airport survey. This expensive gesture at determining in cold figures the economic relation between airports, cities, airlines, other transportation, and national defense and economy, cannot, they say, mean very much and figures arrived at could be radically changed simply by changing economists. The surveyors will write a ten-gallon report which not one Congressman, nobody, in fact, but the proof-reader, may read. It is true of course the Authority was ordered by Congress to do this job. But there's really nothing constructive to do except ask the cities how much subsidy they want and then let Congress argue whether to let them have it. Everybody knows before the report is written that it will recommend federal aid.



In response to REQUESTS *from the* AIRCRAFT INDUSTRY . . .

In developing improved materials and in exchanging useful data, the aircraft designer and the producer of materials have frequently helped each other.

There is the instance of a request from the industry for "tubing free of *black* oxide," which caused Summerill to develop and introduce tubing with an *oxide-free* surface.

Another instance is the distribution of "Aircraft Tubing Data," which at the industry's suggestion included the properties of seamless tubular sections together with column strength curves for different values of end fixity and for 60,000; 75,000 and 85,000 psi minimum yield point.

A recent study, reporting on the physical properties of S.A.E. 4340 steel tubing, was instituted at the request of a plane manufacturer.

Summerill takes pride not merely in making contributions to the total knowledge of tubing but in working closely with a forward-looking, cooperative industry.

SUMMERILL TUBING COMPANY

BRIDGEPORT, MONTGOMERY CO., PENNSYLVANIA

STANDARD SIZE AIRCRAFT STOCKS ARE AVAILABLE FOR PROMPT DELIVERY

DAY BY DAY WITH THE C.A.A.

October 5 United Airlines filed application for permanent Certificate of C & N on six runs.

October 6 Air Transport Association men at a meeting of CAA and safety Board were told the Authority had approved immediate purchase of several radio direction finding ground stations as part of a winter safety program.

October 7 Announces applications for certificates of C & N covering 16 new and 18 existing routes have been filed. New routes largely in Mississippi valley. Act requires certificates be issued to lines operating from May 14, 1938 and to nine routes named for which Post Office has let or advertised mail contracts.

First public hearing under CAA, to decide upon application of Marquette Airlines, Inc. to lease two DC2s from American Airlines.

Five-men working subcommittee appointed to represent about 20 government and industrial organizations which are cooperating with CAA's nation-wide airport survey. They are: O. M. Mosier, Earl D. Mellery, John Berry, Charles L. Morris, Richard Aldworth, Paul V. Betters. (CAA says that's five; we say it's six)

October 10 Amendment No. 2 of Regulations 401-B-1 under the CAA of 1938 particularly sections 205 (c) and 401 (b) changes the first sentence of paragraph (c) so that you gotta send in ten copies of each application for C & N. This one was written by the lawyers and it says a lot, except how many copies were wanted *before* the amendment.

A special order exempts Eastern Airlines from something, we can't tell what by reading two and a half pages of close typewriting. But for the benefit of the customers we get out our law book and look up Sec. 401 (a) Civil Aeronautics Act 1938 and find out what Special order 401-A-6 is about. Reduced to American, it says that Eastern Airlines can operate without a C of C & N, and it gives what look like ten reasons, which ought to be enough. Regulations 407-D-1, in about 500 words, tells operators to go ahead and follow the uniform accounts systems set up by the Post Office.

Special order 401-A-7 exempts Eastern Air Lines from Section 401(a).

Special order 401-A-6 exempts National Airlines, Inc. from Section 401A.

October 14 Memo to aircraft manufacturers reviewing changes in the law, to become effective January 1, 1939.

CAA receives a copy of brief by Interstate Airways Committee for federal aid to airports, leaving open the question whether money shall be spent by CAA or other G agencies.

October 15 In preparation for opening five new airways traffic control stations, officials of CAA announced a week's meeting in Chicago beginning the 17th with managers of eight existing traffic control stations and men chosen to manage the new ones.

Chairman Noble set forth some aims of CAA in an article in the regular Air Commerce Bulletin; again he suggested federal aid for private flying.

October 17 Special Traffic Permission No. 1 excused Railway Express Agency Inc. from filing rates on the deadline date October 17, because exceptional expenses would be imposed upon the company. It says REA may publish, post and file its initial tariffs without complying with the first sentence of Rule 4 (c) of Regulations 403-A-1, whatever that is.

Special order 401-A-9 exempts Braniff Airways from 401(c).

October 19 Purchased one 4-place Waco AVN8 tricycle for testing instrument landing systems; Jacobs-285 engine.

Non-Scheduled operators of aircraft exempted for an indefinite period from securing C of C & N and from certain other provisions of Title IV.

October 20 Regulations covering Class 1, Class 2-S and/or 2-M changed so that gross weights between 1,300 and 1,500 pounds heretofore in Class 1, are included in Class 2-S or 2-M covering units up to 4,000 pounds gross.

October 21 Published a list of applications for C of C & N and foreign carrier permits by 24 companies.

October 22 Approved personnel changes. Howard Rough from assistant director to acting director, Bureau of Airways Development; B. M. Jacobs from assistant director to acting director, Bureau of Safety Regulation and Information; N. B. Holey from director of Bureau of Air Mail to acting director of Bureau of Economic Regulation.

October 24 Announced creation of Internation Division, part of Bureau of Economic Regulation. Samuel E. Gates formerly chief of International Section of the old Bureau, acting chief of the new division.

Established standing committee of Noble, Hinckley, and Hester as liaison with airline pilots as further step in air transport safety.

Held first hearing on application for C of C & N, that of Pan American Airways SF-Hong Kong route.

October 24 Granted motion for dismissal of Marquette Airlines Inc. application for permission to lease certain aircraft from American Airlines.

October 27 Received five various petitions from 66 many companies.

October 28 United, American, and Western Air filed protests against application of TWA for C of C & N. Claim TWA asking for more routes than entitled to under law.

November 1 76 applications for CCN have been received. (Press Release)

November 3 Declaration that civil aviation is being coordinated with national defense. Some European countries are exceeding their aircraft needs and will drive for export markets (Oswald Ryan at Harrisburg).

Contingent upon promulgation of more definite free and reduced fare passenger transportation, operators can issue and interchange such fares for executives, employees, witnesses, counsel, persons injured in aircraft accidents, attending physicians, persons or property providing relief in epidemics or catastrophies. Foreign and overseas services get some extra privileges.

November 4 Amendment No. 1 Regulations 405-M-1. Air carriers forward all statements by 10th each month.

November 6 On October 1 there were 21,526 pilots and 10,091 aircraft certificed as compared with 17,379 and 8,430 October 1, 1937. (Press Release)

November 11 Chairman Noble told Aviation Post, American Legion that Americans must become as familiar with airplanes as ancestors were with flintlocks, or defense will be in a bad way. He said less than ½ of one per cent of population use the airlines. Only 20,000 men and 800 women can fly themselves.

Private airplanes first 6 months 1938, flew 706,238 miles per fatal accident; 626,610 miles in same period 1937. Other statistics quoted. (Press Release)

Operators in Private flying class, with 1,000 planes, flew 12,000,000 more miles and carried 75,000 more passengers in first half 1938 than same period 1937. Total miles 56,499,045; total passengers 710,114. Other statistics quoted. (Press Release)

November 12 Aircraft production for civil use decreased 24 per cent first 6 months 1938 compared with same period 1937; military production increased 95 per cent; planes for export increased 36 per cent; total increased 4 per cent. Other figures quoted. (Press Release)

No date Notice to air carriers: Must file designation of an agent upon whom notices, processes, orders, decisions, etc, may be served. Suggested standard form.

LET'S TALK BUSINESS

Lockheed Aircraft Corp. in November stepped into number one spot among American aircraft builders, with the announcement in Australia that the Dominion Government was ordering 50 "Hudsons", the bomber version of the lockheed 14. The order, representing about $4,250,000, brings Lockheed's backlog to approximately $20,000,000, compared with current Douglas orders of approximately $26,000,000. The race is close, however, as the Douglas backlog was around $35,000,000 a year ago and bids fair to shoot forward again soon. Meantime Lockheed continues to receive important contracts from all corners of the globe. Three Model 14s were ordered by the French government late in October, for delivery within 90 days for Air Afrique, making the 23rd foreign airline or government agency to purchase Lockheeds. Two Electras were ordered late in October by MacRobertson-Miller Aviation Corp. for the Perth-Darwin service, marking the fourth Australian airline to buy Lockheed equipment. In order to better handle current European sales Lockheed has moved its European headquarters from Warsaw to Amsterdam, placing in charge Norman Ebin, for several years European representative. His assistant is Ferris M. Smith, project engineer on the XC-35 substratosphere plane with which the Air Corps won the Collier Trophy for 1937.

Menasco Manufacturing Co books show unfilled orders at Nov. 1st of more than $400,000, exceeding total gross sales for the preceding three years. In addition to its line of engines, Menasco is engaged in machining work for aircraft factories, and is also under contract to manufacture 1,000 American versions of the English Covic Diesel engine. Additional projects include development of the UniTwin power unit for Vega Aircraft, and development of engines in the higher power brackets.

Douglas Aircraft Co. has promoted Major Victor E. Bertrandias and Edmond R. Doak to vice presidencies. Coordinating their efforts under the direction of Major Carl A. Cover, senior vice president, Major Bertrandias will continue in charge of export sales, and Mr. Doak as general manager of the El Segundo division. Both are old-timers. Major Bertrandias saw war service and has been active in Douglas foreign sales work since 1929. Mr. Doak started with Glenn Martin in 1914, has been with the Douglas company since 1922.

Los Angeles Chamber of Commerce reports that aircraft production in that county totalled $42,283,000 for the first ten months of 1938, representing a 54 per cent gain over 1937, and a doubling of the volume of 1936 production. Since more than 60 per cent of this business was in export, the Chamber urges that a vigorous program to safeguard future aviation export markets be adopted. Meetings have been held with aviation executives and representatives of the Bureau of Foreign & Domestic Commerce, seeking to formulate a plan to foster future foreign flying business.

Vultee Aircraft Co. having delivered 26 attack bombers to Brazil, and manufacturing seven similar ships for the Air Corps, is reported negotiating substantial new business. Capt. Hugh Fenwick, Aviation Manufacturing Corp., is representing Vultee at the Paris Exposition.

Ryan Aeronautical Co. has a repeat order from Guatemala for six Ryan S-T M military trainers, an order from Ecuador for the same type, and substantial new orders for exhaust manifolds and parts, bringing current unfilled orders to $350,000.

Aircraft Components, Inc. has been organized to take over all assets of Herberts Engineering Corp., which will be dissolved. The latter was formed in 1938 to manufacture aircraft hydraulic actuating systems which had been developed by Herberts Machinery Co. Aircraft Components, Inc. will continue to manufacture hydraulic assemblies for Douglas, Vultee, Lockheed and others, and will give attention to the design of new models of such equipment. Registration statement has been filed with SEC covering issuance of 20,440 shares of $5 par value common stock, in exchange for Herberts stock now outstanding. Further provision is made for issuance of up to 17,560 shares to underwriters at $9 for sale at $10. C. A. Herberte president and director of the new company, remains president of Herberts Machinery Co.; Charles T. Leigh, vice president and director, is vice president and director of Consolidated Aircraft Corp.; R. J. Wig, secretary-treasurer, is a director of Douglas Aircraft Co.; Robert E. Gross, director, is president-treasurer of Lockheed Aircraft Corp.; Richard W. Millar, director, is vice president of Aviation Manufacturing Corp. and general manager of Vultee Aircraft.

Beech Aircraft Corp., in cooperation with Aero Insurance Underwriters, has arranged for the latter to offer to purchasers of new Beechcraft biplanes full hull insurance coverage, including crash, fire, windstorm, tornado and cyclone, land damage, collision hail, and theft, at an overall rate of 2.75 per cent, available to private owners whose record is acceptable to the underwriters. The Beech people feel that the whole aviation industry will eventually benefit through the successful working of this plan.

North American Aviation has received a $303,132 contract for naval aircraft from the Navy Department.

Lisle Air Products Co. has acquired a 32-acre tract adjoining its $1,500,000 plant at Tonawanda, N. Y. for plant expansion.

United Aircraft Products, Inc of Dayton, reports sufficient orders on hand for full time operation through 1940. Company is supplying fuel line accessories for 200 pursuit and 200 observation planes ordered by the British government in this country. They are also receiving government orders, and supplying major aircraft companies in this country and Canada.

Glenn L. Martin Co., alarmed at the threatened shortage of foremen and shop executives in the industry, is cooperating with Baltimore's educational authorities to help students prepare themselves for promotion. Twenty representatives of Martin engineering and tool design departments instruct more than 400 students in blueprint-reading courses at the city's Polytechnic Institute on Saturday mornings. The project was started last year, and this year's enrollment shows a 30 percent increase.

Seedix Aviation Corp has announced that, effective Nov. 1st, the salaries of all employees who were receiving $300 a month or less on March 31 last, are to be restored to the level prevailing at that time. Ruling applies to all subsidiaries and divisions of the company.



EDMUND R. DOAK
Directs Douglas' El Segundo



MAJOR VICTOR BERTRANDIAS
Heads Douglas' Export Sales



CYRIL CHAPPELLET
Biggest Backlog Secretary (Lockheed)

PROFITS AND LOSSES

» BENDIX AVIATION CORP. and Subsidiaries, for quarter ended Sept. 30, 1938, net profit $89,784, equal to 4 cents each on 2,097,663 capital shares; compared with $65,806 or 3 cents a share in preceding quarter and $279,207 or 13 cents a share in third quarter of 1937. Nine months to Sept. 30, 1938, net loss of $406,205, against a profit of $1,911,168 last year. Twelve months to Sept. 30, 1938, net loss of $62,240 compared with profit of $2,729,789 or $1.33 for same period last year.

» BOEING AIRPLANE Co. and Subsidiaries, for quarter ending Sept. 30, net income of $51,470 after depreciation and taxes, equal to 7 cents each on 695,653 shares of $5 par capital stock. Compares with net income of $121,546 or 17 cents a share in same quarter of 1937. For nine months ending Sept. 30, net loss was $40,709, compared with net income of $375,443 or 54 cents a share for first nine months of 1937. Statement does not include provision for losses on certain work-in-process inventories on hand as of Sept. 30, 1938.

» BREWSTER AERONAUTICAL CORP., for nine months to Sept. 30, 1938, net profit of $234,382 or 67 cents on 350,000 common shares against loss of $47,928, for Feb. 8, 1937 to Sept. 30, 1937. Net profit for September, $5,857.

» CURTISS-WRIGHT CORP. and Subsidiaries, for quarter ending Sept. 30, 1938, net profit of $444,036 or 38 cents a share on 1,158,464 shares of Class A stock, compared with profit of $690,387 or 1 cent on 7,427,670 common shares for same period last year, and $1,447,951 or 12 cents a share on 7,429,051 common shares for quarter ending June 30, 1938. For nine months ending Sept. 30, 1938, profit of $2,625,898, equal after dividend requirements, to 12 cents a share on 7,429,068 shares of common stock, compared with profit of $1,591,584 or $1.37 on 1,158,888 shares Class A for same period in 1937. Company declared a dividend of $1 on class A stock, payable Dec. 15th.

» DOUGLAS AIRCRAFT Co., for nine months ending Aug. 31, 1938, net profit of $1,821,964 or $3.18 a share, compared with $852,795 or $1.49 for like period in 1937. Dividend of $3 declared, payable Nov. 24th, the first since that of Sept. 1935, of 75 cents. Net sales for the nine months aggregated $22,898,838 against $15,276,504 in same period last year. A blanket wage increase of 2½ per cent, effecting 5,500 employees was also announced. Net sales for the first nine months registered an increase of 49 per cent over 1937, deliveries, 353 planes against 224 in 1937. Latest backlog showed $25,638,330 in unfilled orders against $34,800,000 a year ago.

» FAIRCHILD AVIATION CORP. for nine months to Sept. 30, 1938, net profit of $255,402 or 75 cents each on 337,032 capital shares, against $124,827 or 37 cents in 1937. Unfilled orders at Sept. 30, $1,173,142 against $1,251,256 for previous year.

» IRVING AIR CHUTE Co. declared an extra dividend of 25 cents, and the regular quarterly dividend of 25 cents. Backlog of "substantial orders" assures capacity operation in all plants for some time to come.

» GLENN L. MARTIN Co. for quarter ending Sept. 30, 1938, net income of $768,383 equal to 82 cents each on 938,583 common shares. Compares with $492,532 or 53 cents for Sept. 1937 quarter. Net income for first nine months of 1938 was $2,140,994 or $2.28 on 936,583 shares, against $1,018,839 or $1.17 on 870,041 shares for like period last year.

» MENASCO MANUFACTURING Co., for year ending June 30, 1938, net loss of $95,045. This figure includes substantial book adjustments to write down inventory on hand but considered obsolete.

» NORTH AMERICAN AVIATION, INC., for nine months ending Sept. 30, 1938, net profit of $1,014,430 after depreciation and taxes, but not including $554,-488 from sale of air transport division and stock of Montreal Aircraft Industries, which amount was transferred to Capital Surplus. Eastern Air Lines operations were eliminated after Mar. 31, 1938. For comparable period in 1937, net profit after deductions was $225,787,



JOHN D. MILNER
To Push Ryan's Factory Sales



A. A. MATHEWSON, JR.
Will Plan for Solar as V-P.



but did not include profit of $1,267 on sale of securities

» RYAN AERONAUTICAL CO and Subsidiary, for eight months ending Aug. 31, 1938, net income of $31,451 after charges but before Federal income taxes, compared with $18,995 for the entire year of 1937. Combined gross income for the first eight months was $429,488, a 45 per cent increase over the 1937 period. Net income for first eight months in 1938 equals 11 cents per share on 269,650 shares of stock outstanding.

» SOLAR AIRCRAFT CO. for 24 weeks to Oct. 15, 1938, net income of $43,727, after taxes, equivalent to 32 cents on 138,243 shares of $1 par value capital shares outstanding, representing a 152 per cent increase over same period in 1937. AVIATION erred last month in reporting a dividend of $1 on common stock of record Oct. 1. This should have read that a 5 per cent quarterly dividend on $1 common capital stock of record Oct. 1 was announced.

» UNITED AIRCRAFT CORP. and Subsidiaries, for nine months ending Sept. 30, 1938, net profit of $3,564,405 after deductions, equal to $1.40 each on 2,543,140 shares. Compared with profit of $2,720,698 or $1.08 on 2,350,295 shares for same period in 1937. Net profit for third quarter of 1938 was $1,142,864, after charges, or .45 cents on 2,543,140 shares.

» WRIGHT AERONAUTICAL CORP. for nine months ending Sept. 30, 1938, net profit of $2,490,995 or $4.15 a share, compared with $1,647,190 or $2.74 a share for like period in 1937. For quarter ending Sept. 30, 1938, net profit of $822,740, after depreciation and taxes, equal to $1.37 on 599,857 no-par shares of capital stock. Compares with $1,081,958 or $1.80 per share for quarter ending June 30, 1938. Company votad a $2 dividend on common stock payable Dec. 14th.

AS OTHERS FLY IT

A Birdseye-View of Aviation Abroad

Great Britain to Spend a Billion on Air Force

Post Munich preparation in Britain and France may be like locking the door after the horse is stolen, but both countries are out to get ready before the barn goes too. . . . The British have boosted the R.A.F. budget for next year to £200,000,000—a jump of 75% over this year's. Ships already ordered and about-to-be ordered total between five and six thousand. There has been another mild shakeup in the procurement side of the Air Ministry, and talk of a Ministry of Munitions with wide powers to force on armament speedup is louder than ever. . . . The shadow factory system is still being expanded, and it's really beginning to turn out some planes. Production now is running about 50% ahead of last spring (when it was about 200 a month)—by next spring it's expected to double present figures. There's a catch, though, as C. G. Grey delights in pointing out every time there's a big burst of British pride at breaking ground for a new shadow factory. The boys are now just finishing plants to build planes that were designed four years ago. It looks as if the British may find themselves on the spot the French did a while back—all dressed up with a lot of ships that are obsolescent by the time they are produced in quantity. It's a tough job keeping out of this position.

It's the other way 'round in France. Give the French credit, they've brought out in the last year a bunch of fighters and light bombers that even the Germans think are good. The only trouble is that they can't seem to build more than a couple a month. Everybody has his explanation—nationalization of the biggest factories, the 40-hour laws, lack of money, too many changes in government policy and personnel, and just plain bad luck. Engines are the sorest spot, beside production troubles there's been a lot of grief with new high-output radials not cooling properly. They seem to be whipping this now, and they're also supposed to be about ready to start making Pratt and Whitney engines under license. There's even talk of a big order of them from the U.S. to help out. There are some favorable signs—new plants have been coming along and are pretty well tooled up for real work, the government has cracked down hard for longer hours, and there's a general realization that the only way out is to spend more time building airplanes and less arguing over who's to blame for what's gone on. The latest program calls for 4,560 new ships by April 1940, which means an average production six times as high as the rate of the last six months.

What will all this cost? In France a lot of people are wondering about those 4,560 new planes, and even more about the 6,000 or 8,000 or 10,000 that are going to have to replace them in the next few years. They wonder how France can support such a fleet, and even the patriots are beginning to think that maybe France's economic and productive capacity isn't great enough to keep her in the runnings as a first-class air power if the present pace keeps up for long. Britain doesn't have any choice—her geographical location and economic organization mean she's got to keep on being a first-class power or bust in the attempt. How big air forces Germany and Italy can keep up are anyone's guess, but even in those countries a few people have to be left over from the aircraft industry to grow potatoes and make pants. Those stories of air disarmament pacts being on the fire probably don't have anything behind them, but everywhere people are beginning to catch on that you can't always build twice as many planes this year as you did last. Our guess is that short of a general war, the next year or so should see a move to stabilize air strengths somewhere around the high levels that will be hit then. Even so, it's going to take about as much work to maintain that strength in up-to-date equipment as it takes now to build it up.



AVIATION PEOPLE—Of the most distinguished kind. The National Advisory Committee poses for its first portrait in years. Left to right: Clinton Hester, C.A.A. Administrator; Capt. S. M. Kraus, U.S.N.; Brig. Gen. A. W. Robins, U.S.A.C.; Dr. L. J. Briggs, Dir. of the Bureau of Std's; Dr. E. P. Warner; Dr. Orville Wright; Dr. Joseph Ames (Chairman); Dr. C. G. Abbot, Sec'y of the Smithsonian; J. F. Victory (Treasurer); Rear Admiral A. B. Cook, U.S.N.; E. J. Noble, Chairman of the C.A.A.; Dr. Vannevar Bush; Dr. J. C. Hunsaker; Dr. G. W. Lewis. Absent are Maj. Gen. H. H. Arnold, U.S.A.C. and Col. Lindbergh.

30,000 applicants for the British Civil Air Guard got in before training facilities were swamped and the doors were closed. When the scheme got underway there were howls from almost everyone involved but the CAGs themselves. Old flying club members found the rush kept them from putting in time, and complained that one good pilot with some real hours to his credit was worth ten able to get off the ground and stagger around. The shortage of instructors led the Air Ministry to hint that instructor ratings would be suspended and holders of A and B licenses (private pilots) allowed to train the CAGs. This set off the British Guild of Air Pilots, who saw themselves being done out of jobs just when business was picking up, into a long defense of the high standards of British instruction and dire predictions of what would happen. They finally crossed their fingers and agreed to accept it for a year rather than hold up the whole parade. People came down on the flying clubs like poor relations on a sweepstakes winner—the insurance companies asked for 5% of the gross subsidy, the airports wanted a big increase in landing fees, and light aeroplane salesmen were out their doormats. In spite of it all, a few CAGs managed to get into the air and the Empire breathed easier.

The Dutch are looking ahead with plans for their Amsterdam-Batavia line that will make their competitors on the eastern route look like the pony express. K.L.M. has usually been one jump ahead on this run, and evidently intends to stay there. . . . There have been stories for some time that they were going to relocate their route to jump from Columbo off the southern tip of India right across 800 or so miles of Indian Ocean direct to Sumatra, but the official word was that this dope was very premature. It's also no secret that they're very much taken with the Douglas DC4. Now the whole picture is unveiled. Purchase of DC-4s is supposed to be practically a sure thing. They'll cut straight across Europe and the Near East from Germany to Basrah, and from there on to Columbo and Batavia. Flying day and night, they'll chop the 5½ day trip to 2½, and they figure fares can be dropped too.

Big British ships are on the way—three landplanes and three boats—all from Short Bros. The landplanes will gross 71,000 pounds, and are to carry 18 passengers and 3,000 pounds of mail and express with a 3,400 mile still air range. Two are designed to operate at 10,000 feet, but the third will have a pressure cabin and a cruising speed estimated at 250 mph at around 25,000 feet. The boats will be big brothers to the present Empire boats, running around 74,000 pounds gross. . . . Each will have four of the new 1,375 hp. Bristol Hercules sleeve valve engines, 14 cylinder two row radials. Those on the substratosphere ship will probably have two speed superchargers—this version is about to be type-tested . . . Imperial could use some more money-making equipment. Profit in 1937 dropped to £97,000 against £105,000 in 1936. The usual 7% dividend was declared on the £1,620,000 capital.

A 438 mph. pursuit and how it grew was one of the highlight talks at the Berlin conference of the Lilienthal Gesellschaft. Dr. Heinkel traced the development of high speed planes in recent years, and made a few guesses at the future. According to him engine progress has furnished a steady increase in speed from year to year, but beginning in the early 1930s the curve started up fast when people began making aerodynamic improvements, mostly by getting rid of parasite drag. His He 112U fighter looks to him like the end of the line as far as parasite drag reduction goes, and since a pilot can't be squeezed into any smaller fuselage than present motors fit, about the only way to improve the breed is by doing something with the wing. As the lift coefficient for high speed flight is very small, the little that could be saved in induced drag by going to high aspect ratios would be more than lost in increased structural weight—he expects ratios between 8 and 10 at speeds around 400 mph, with section thickness around 12%. Fowler flaps will do a lot to reduce wing area and drag, but to get up to really high speeds and keep reasonable landing speeds boundary layer control is about the only thing that will give big enough lift coefficients. Propellers are a big problem. On ships designed for around 375 mph even a variable pitch prop is stalled or working inefficiently at take-off, and the only way out looks like a two speed gear on the motor. . . . When designers start going out after really high speeds over 500 mph they'll have to cut aspect ratio and thickness ratio down even lower. By that time compressibility will start causing trouble by running up the drag on propeller, wing, and fuselage. Since the speed of sound decreases with temperature, this effect will show up first at high altitudes. Up to about 500 mph you should keep on going higher, says the Doctor, but from then on you should come down until a top of around 625 for anything that looks like an airplane and is pulled by a prop will be back at sea level.

LOGGING THE LINES

Air Transport Drift Sights

by DAN SAYRE



Big Three Sign Papers for North Beach Move

Mayor Fiorello LaGuardia, Q.S. has won the long Battle of the New York District for his new North Beach airport. On Nov. 19th, with a proper dash of ceremony out on one of the new paved runways of the field itself, he held a fine big lease-signing party. American Airlines signed up for three huge hangars on one side of the landplane administration buildings for a yearly rental of $125,000. On the other side of that building TWA signed up for two hangars at $53,000 a year, and United signed up for one at $35,000. Among those present at the party were C. R. Smith of American Airlines and his new New York District Sales Manager Charles R. Speers; Harold Crary of United Air Lines, and Don Crichton, head of United's airport division; H. H. Gallup, superintendent in charge of operations of TWA's Atlantic Division. American has announced it will move the major part of its office activity as well as its eastern operations and maintenance headquarters to the new site. Pan American Airways has so far signed no lease for space in the huge seaplane hangar, but is in active negotiation. Eastern Air Lines possibly will occupy no hangar space at the new field but will certainly operate schedules to the port.

Biggest airline story of the month is the quiet application of United Air Lines to the C.A.A. that its pay for mail carriage should be changed from an airplane mileage basis to one for actual pound-miles for mail carriage performed. Pointing out that it currently carries 33 per cent of the nation's air mail, United takes the position that an air carrier's compensation should be measured by the amount of work actually performed, and that the pound-mile unit is the best measure of such work. Assuming that the Authority will grant such a basis for pay, United petitions for 1.08 mills per pound-mile for mail flown on its New York-Chicago,-San Francisco route or 1.52 mills for its entire system. Since as we showed in these pages several months ago, United's last year's income per pound-mile was only .71 mills per pound-mile, the granting of such a request by the C.A.A. would mean a very substantial increase in United revenues.

Along more orthodox lines Western Air Express asked the C.A.A. to set rates of 43c per plane-mile on its Salt Lake-San Diego route, or 50c per plane mile for its total network. If loads should in any case exceed 300 lbs., W.A.E. asked a 10 per cent increase in rates for each additional 100 lb. Penn Central asks 38 cents per mile over its entire system with the same request for additional payments above 300 lb. An interesting footnote on the latter request is that Penn Central which got its Washington-Buffalo contract by bidding .0006$ cents per mile against TWA's bid of a mill per mile, asks for temporary relief on that route of 33⅓ cents.

Just to keep C.A.A. up on its toes Boston & Maine last month petitioned for a certificate of convenience and necessity between Boston and New York, thus posing a question of whether American Airlines service of that particular route is sufficient for such public convenience and necessity.

» EASTERN AIR LINES, INC. and predecessor company, for nine months ending Sept. 30, 1938, net profit of $137,538 after charges and taxes, or 33 cents each on 416,666 capital shares. Compares with $127,112 before Federal income taxes in same period last year. Gross revenues were $4,154,834 against $3,581,485. Since May. 31 net profit of Eastern Air Lines, Inc. has been $38,778 after charges and taxes. Earnings before April 1st accrued to North American Aviation, the predecessor company.

» PENNSYLVANIA-CENTRAL AIRLINES CORP., for nine months ending Sept 30, 1938, net loss of $15,877 against loss of $107,443 for 1937 period. For quarter ending Sept. 30, 1938, net income of $27,250 or 11 cents a share, against $7,472 or 3 cents a share in June, 1938, quarter.

» UNITED AIR LINES TRANSPORT CORP. and Subsidiaries, for quarter ending Sept. 30, 1938, net profit of $115,900, compared with net loss of $243,031 in preceding quarter, and net profit of $411,664 in third quarter of 1937. Nine months to Sept 30, 1938, net loss of $794,901 against loss of $50,921 in 1937.

AIR TRANSPORT INDICATOR

November 1, 1938

115.9

Which is the ratio of the revenue passenger miles reported by the Air Transport Association as carried by all domestic airlines during October, 1938, to the corresponding figure for October, 1937.

For the second time in 1938 traffic, at 51,000,009 pass-mi., was new all-time high. First ten months totals: 1937 — 355,009,009; 1938 — 397,000,000 up 11.9 per cent.



NEW EAGLE'S NEST An architect's drawing of the three hangars-plus-offices Americas Airlines has leased at the new North Beach Airport. Moving day—about May 1, 1939.

NEW RADIO RECEIVER by Western Electric

25A, FOR ITINERANT FLYERS, IS LIGHT, COMPACT, COVERS 3 FREQUENCY BANDS

A HIGHLY selective superheterodyne receiver, the 25A covers the following frequency bands . . .

1. *195-415 kc:* U. S. Department of Commerce beacon signals and weather reports;

2. *495-1200 kc:* International Distress frequency and most commercial broadcast stations;

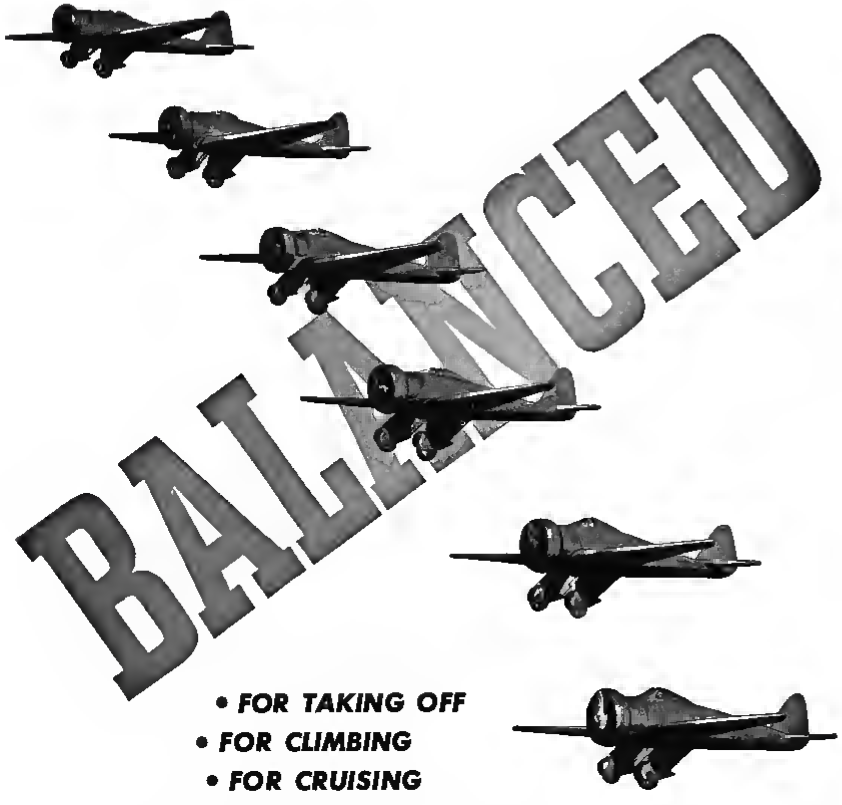
3. *2000-6000 kc:* Air transport communications.

The 25A provides for crystal control of any two frequencies in the air transport band—automatic volume control for all except the beacon band. Reception of any of the three separate frequency bands is obtained by a simple switch and tuning adjustment.

Equipment consists of radio frequency unit for instrument board mounting, and audio-power unit. Inter-connecting and power cables are included—electrical connections are made through plugs and jacks. Air controls, together with telephone jack, CW and MCW switch are on front panel of radio frequency unit. Total weight, including cords and plugs, is about 16 lbs.

This little 25A receiver is as sturdy and dependable as the larger Western Electric units used by all the major airlines in the country. *For full details: Western Electric Co., Dept. 322 A, 195 Broadway, New York.*





• FOR TAKING OFF
• FOR CLIMBING
• FOR CRUISING

EXPERIENCED PILOTS know that a *balanced gasoline* means better all-round performance . . . economical warm-up, quicker throttle response, greater cruising range.

Shell research has developed for you *balanced* aviation gasolines with octane ratings from 73 to 100. This new balanced fuel means quicker starting, more "revs" during the take-off and climb, and, in addition, lower fuel consumption.

For complete information on any of Shell's line of aircraft petroleum products, write to the Shell Aviation Department, Shell Building, San Francisco, California; or Shell Building, St. Louis; or 50 West 50th Street, New York City.

SHELL

AVIATION GASOLINES

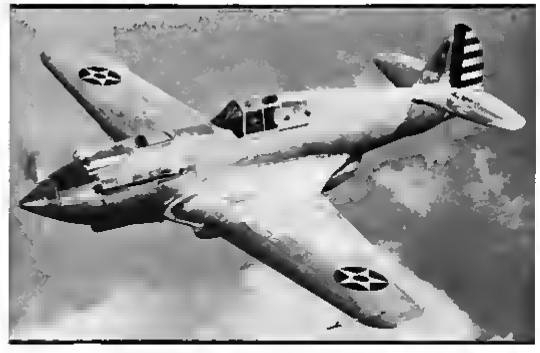
President Wants Planes

(*Continued from page 53*)

clocks by it). In a wide national survey tabulations showed 65 voters in every hundred thought the Army should be enlarged. 71 per cent thought the Navy should be increased. Add to this the country's indignation over current European developments and the undoubted importance air power has played there, and you get assured Congressional support for the program.

Background projects—The President is apparently as convinced as he should be that the mere stepping up of the procurement of aircraft is only a very small part of the program. Estimates by aeronautical experts place the number of personnel needed by the service directly at at least two pilots and five mechanics for each additional plane. Obviously both services must therefore undertake a greatly augmented training program. As a first move, on the Army's side, Brig. General Barton K. Yount has been moved from Randolph Field to Washington to draw up a plan for speeding activities not only at Randolph but at the Army's technical schools as well. Even broader is the large increase in trained factory workers which the industry will require to get itself upon the "hundred per cent" production basis most generally spoken of in describing the Administration's plans for the industry. Hare relief funds will be used. Already announcement has come from Washington of plans to set up aircraft workers' schools at the New Orleans Navy Yard and the Charleston, West Virginia armor plate factory, under the direction of the National Youth Administration. New York City, which already has extensive aircraft mechanical training courses in its high schools, is also a logical center of NYA projects along this line. Another use of already appropriated relief funds which seems certain to be made is in a vastly stepped up program of airport, hangar and shop projects at military and naval bases. Further in the background, but by no means unmentioned, is the possibility that the government may build one or more production units of its own to operate on the same nationalized basis as the Naval Aircraft Factory at Philadelphia.

The President saw some fine planes when he drove out to Bolling and Anacostia early last month to look over a display of Army and Navy types. At Bolling he saw the B-17 "Flying Fortress", the BT-9 Basic Trainer, the BC-1 Basic Combat Plane, the A-18 Attack, P-35 and P-36 Pursuits, the XB-15 "Super Fortress," the O-47A Observation, the PT-13 Primary Trainer, and the brand new Curtiss XP-40 pursuit job. He also showed considerable interest in the Lockheed supercharged cabin job with which the Army last year won the Collier Trophy. At Anacostia, the Navy showed him an excellent display of their carrier-deck aircraft and the new four-engined Consolidated patrol plane just ferried in from San Diego.



ARMY'S LATEST. First photo of the Curtiss XP-40 with the larger Allison.

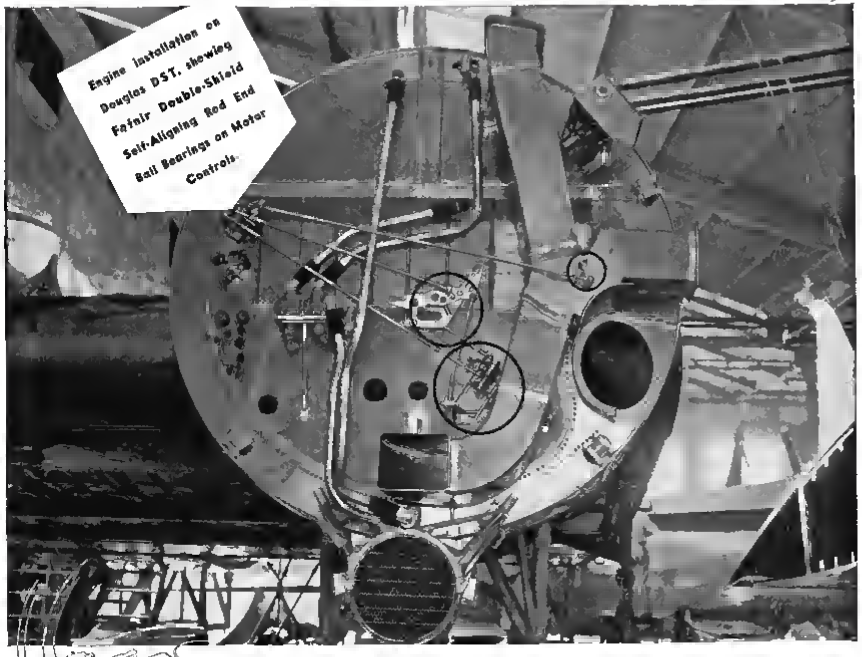
SCOUTING THE SQUADRONS

Notes and Comment on our Air Defenses

Training, training, training, will be the keynote of Air Corps activities if the President's ideas of increasing our air strength to European levels receives approval from Congress. Foreseeing this, Secretary of War Woodring has already transferred Brig. Gen. Barton K. Yount from the post of Commander of the Air Corps Training Center at Randolph Field, Texas, to the office of the Chief of the Air Corps. There he will head an augmented training division which will not only direct the rapid growth of schools for flyers, but for ground mechanics as well.

Admiral Cook reports on the Navy's Bureau of Aeronautics during the fiscal year 1938: "... Thus far procurement has not been advanced by the expansion program recently established during the last session of Congress. ... Shore facilities ... are being developed gradually but in no measure commensurate with the present and contemplated expansion. The concentration of carrier aircraft in the Norfolk area ... has focused attention on the need for greater facilities on the East Coast. ... The operations of the patrol planes attached to the Aircraft Scouting Force have been seriously hampered by the lack of supporting tenders. ... Two destroyers, the Childs and Williamson (will be assigned to tender service) this year. One large seaplane tender, the Curtiss, is under construction and it is expected that an additional large seaplane tender and two small seaplane tenders will be laid down during the current year. ... Two aircraft carriers were placed in commission, the Yorktown on 30 September, 1937, and the Enterprise on 12 May, 1938. ... These vessels will be ready to join the Fleet by about the first of the calendar year. ... The (experimental project) program of the Bureau of Aeronautics envisions retention of a position ahead of other world powers, but realization of this objective necessarily is limited by appropriation allocated to the purpose. The policy of delivering new aircraft by air and of ferrying some old to East Coast stations for overhaul and return was continued. This involved a total of approximately 350 transcontinental flights during the year. ..."

Lieut. Col. Lasila MacDill and Private Joseph G. Gloxner were killed last month when their plane crashed in an Anacostia street three minutes after takeoff from Bolling Field. The loss of Lieut. Col. MacDill will be deeply felt by the Service he did much to develop. Entering the Army from civil life in 1912, he transferred to the Aviation Section of the Signal Corps in 1914, becoming a Junior Military Aviator the following year. After a war service in important executive posts in France with the A.E.F., MacDill, now a Major, pursued a course of graduate work in aeronautical engineering at the Massachusetts Institute of Technology, winning a Doctor of Science degree in 1922. Thereafter, until 1930 he served in various capacities in Dayton, Ohio, in connection with the experimental and procurement work which has become such an important keystone in the Air Corps' organization. For much of that period he was assigned as Chief Engineer Officer of the Engineering Division. Since 1930 Col. MacDill has served in the Office of the Chief of the Air Corps in Washington, attended the Army War College, and the Naval War College, and been a member of the War Department General Staff.





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LES NEVILLE

Federal aid for private flying seems to be in the offing and several plans are under consideration. Among them is a well thought-out plan originated by Alfred B. Bennett of Hightstown, N. J., who began as an unemployed pilot during the worst of the depression and has built up a yearly business of $100,000.

The project calls for payment by the government to student pilots of $50 upon soloing and $50 upon completing 10 hours solo flying while anyone other than commercial pilots receives two payments of $50 each for the first 2 10-hour periods of flying they do after receiving their coupons. Two coupons are issued by the CAA medical examiner to the student pilot when he gets his student permit and to the non-commercial pilot when he takes his annual physical test for license renewal.

While the plan is simple in form, its benefits would filter through the entire aviation industry. Starting at the logical source the retail consumer (the pilot) the money is paid to the instructor thence to the airport operator, field employees, mechanics, etc., as well as to aircraft manufacturers who in turn use it largely for payrolls and the purchase of accessories and materials whose manufacturers also have payrolls.

Having heard of this plan, many a small fixed base operator has felt a surge of encouragement when he adds up the figures—$100 more from each of his—let us say, 20 students would amount to $2000 plus about 40 others he knows of who would fly if they had the money. That equals $4000 or a total of $6000 per year more than he handles now.

It is interesting to guess how many flying clubs there are in the process of formation whose problems would be solved when each member knows he will get $100 each year. How many pending airport projects would be started if their sponsors knew that every youth or adult who wants to fly, would receive $100 annually for that purpose.

The relatively small inducements for each prospective pilot are sufficient to arouse his interest in aviation and get him started on his flying career. To continue extensively he must spend money of his own. Thus if Congress appropriates $20,000,000 for this purpose, it could count on at least $60,000,000 which would go into flight training, building and maintaining airports, manufacturing new air planes and strengthening the aviation industry.



ASKS SUBSIDY. Al Bennett develops plan for federal aid to private fliers.

Everybody wants a field at Big Bear Lake. According to an announcement from Beltrand E. Rhine, the aircraft manufacturers of California, the airlines operating out of Los Angeles, the Aviation Country Club of California, and Non Scheduled Aviation, Inc., are all cooperating in a campaign to obtain a U. S. government established and maintained intermediate airport there at an altitude of 5,000 ft. in the San Bernardino mountains. The airport site is approximately sixty miles due east of Los Angeles. It would serve the fourfold purposes of providing an ideal recreation spot for private fliers wishing to fly to the mountain resorts on or near Big Bear Lake, providing non-scheduled operators with an attractive trip for charter parties, providing scheduled airlines with an excellent and unique emergency field in the event weather or fog would prevent operating into field at low altitude, and would provide airplane manufacturers with a mile high test field right at their back doors. The field site is now improved sufficiently for use by private pilots and is regularly used by small parties making week-end trips, etc.



21¿ HOURS, 23 MINUTES is the new light plane endurance record.

Up the ladder and down the 'chute was the method used in breaking the former light plane endurance record by a decisive margin when a trio of pilots conjured together recently to keep a Piper Cub with Continental engine soaring over Southern California for ten days and nine nights. A leaking fuel line finally brought the plane down, after amassing a total hourage of 218 hr. 23 minutes. Pilots Clyde Schlieper, Thomas H. Smith, and Harley Long alternated at the controls, although the first two named were in the cockpit for both take-off and landing. Fuel was taken aboard by rope contacts in flight with a refueling truck speeding over the bed of Rosamond dry lake, on the Mojave desert. Pilot relief was accomplished somewhat similarly, the excess pilot making a parachute jump in order to make room for the relief pilot, who climbed up a rope ladder from an automobile. The test was sponsored by Aircraft Associates, Inc., California distributors for Cub aircraft. Harvey Martin, president of Aircraft Associates, indicated an attempt might later be made on the all-type airplane endurance record of 653 hr. 34 minutes.

Magnaflux Service for private owners is now available at the well equipped repair station of Snyder Aircraft Corp. at Chicago Municipal Airport. Not only is this examination service available for overhaul jobs, but it is applied to the reconditioned steel engine parts sold by the company. This Snyder organization

issues a complete catalogue of new and reconditioned engine parts, instruments, and supplies

82,500 passengers in 16 years without accident or injury is the record of Captain Robert S Fogg who opened a new base at Wolfeboro, N. H., this year In a period of 12 weeks, Capt. Fogg made 800 flights and carried 2,500 passengers, using a Beechcraft on floats Record day of the season scored 53 flights and 207 passengers.

Shouting and near fist fights were the order of the day when California aircraft mechanics and other aviation people responded to the invitation of the C.A A. for a public hearing of suggestions relating to the proposed new part 24, Mechanic Rating, of the Civil Air Regulations Approximately five hundred agitated citizens attended the meeting, November 1st, in Fairfax High School Auditorium, Hollywood, which was organized by Col Joseph Marriott, and there finally emerged the almost unanimous voice of the meeting to the effect that the proposed new part 24 should not be made effective December 20th, next, as proposed This feeling coincided closely with that expressed at a similar meeting held in Chicago October 28th A third such meeting was held for New York city, November 8th.





NEW PENNSYLVANIA AIRPORTS Above—Reading has excellent facilities close to the city. Below—Administration building at Harrisburg's State Airport, Martinsburg, Pa.

REPORT CARO

Of Air School Developments



STUDENT FORMATION Ryan pilots on the California Aviation Country Club tour.

Far into the night, the new heat treating furnace at Curtiss-Wright Tech has been working on actual aircraft parts sent in by private owners and airports 60 new students began their instruction in a recent class Of this group 47 enrolled for the master mechanic course and 19 for aeronautical engineering

Take your magnetos to Ryan for service The school maintenance department has just been appointed an authorized Scintilla service station, according to an announcement by Vice President Earl Prudden Scintilla service at Ryan will be in charge of Walter Balch

Barbers can learn to fly free if there are other pilots like Arthur S. Pierce who has insured his supply of tonsorial service for the next year by making a dicker with Barber Harry H Gramley of Lock Haven to teach him to fly for 24 haircuts, 200 shaves, 12 scalp treatments, 24 tonics, and 10 messages

Airport Management, Inc, operators of Alhambra Airport, Calif, report record activity by Western Air College, chief field tenant Five new units of machinery have been installed in the school shop Flying activities currently include students active in aerobatics, instrument flying, and night cross country Airport Management has organized a financing company to promote time sales of new and used planes The company also will purchase and rebuild damaged or wrecked aircraft.

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TULSA, OKLAHOMA

3 Cent Air Mail?

(*Continued from page 23*)

During 1939 it is expected that the primary plan will become fully operative. The ultimate goal is the adoption of air transmission at ordinary rates for *all* first class mail exchanged within *all* parts of the Empire.

One of the very first things which the adoption of this principle entailed was the complete overhaul of the primary "chosen instrument"—Imperial Airways. In 1936 Imperial Airways flew 4-million ton miles of mail, express and passengers. Under the new principle it had to provide a capacity of at least 14 million ton-miles for the carriage of mails alone!

Twice weekly services to India, to take one example, were to be increased to five a week, and transit time cut in half. Both the speed and frequency of services to Singapore, Australia, East Africa and the Cape were to be similarly advanced.

To meet its new obligations, Imperial Airways placed the biggest single order ever given for large commercial aircraft. Twenty-eight flying boats were ordered from Short Bros. and the contract has since been materially increased.

A large fleet of special high-speed motor launches were built. Additional flying officers, radio operators, flight clerks, mechanics and ground personnel had to be recruited and trained. Airway facilities and meteorological and radio services throughout the entire Empire network have been greatly expanded.

All these activities and improvements stem directly from the basic Government decision to forward unsurcharged mail by air. Already Imperial Airways carries more mail *in six weeks* "ex-Southampton," from the British Isles to the Dominions than *all* the outbound airmail carried by *all* U S. foreign airmail routes *in an entire year!*

The repercussions of the Empire air mail program are revolutionizing air transportation activities in more than one British possession. To refer again to India, Tata Airlines has increased their ton-mile capacity fourfold and stepped up their frequency on the Karachi-Bombay-Colombo route from two to five times a week. Indian Transcontinental Airways are now scheduled to operate three million ton-miles a year, a gain of 400 per cent. The recent purchase of several American planes by Indian National Airways for their Karachi-Lahore line is a direct outcome of the British "all-up" mail policy.

The application of such a revolutionary principle has not been all easy sailing. Post Office officials at first were the target of many criticisms on the grounds of security. People were afraid to trust their letters to air carriage. Objections were also raised because of increased postage cost. These have all now died away.

The new universal letter rate adopted by the Home Government (Dominions and Colonial Governments are free to fix their own rates) is 1½ pence, or three cents, per each half-ounce. (The old *ordinary* mail charge was 1½ pence for the first ounce and 1 pence for each subsequent ounce. Former *airmail* rates ran from 6 pence per half-ounce to South Africa, up to 1 shilling 3 pence to Australia.)

British postal authorities frankly state they expect to lose money on the "All-up" program at the start. They estimate an annual loss at first of about $1,000,000 a year, but they believe they will more than gain it back during the fifteen-year period of the contract. While there is some net gain to the Post Office from the higher rate on larger units this is more than offset by the public's use of lighter weight correspondence paper and the consequent increase in the number of letters weighing under half an ounce. From 70 to 80 per cent. of all letter mail now falls within the half-ounce limit.

One interesting result has been that the volume of second class mail, which is still sent by the land and sea routes, has shown a definite increase. Every Thursday a special all mail train leaves Calais with GPO attendants aboard, carrying British second class and parcel Empire mail for the weekly sailing from Marseille. These shipments are approximately eight times the bulk of first class mail. Since contracts for surface carriage do not generally distinguish between different classes of mail matter, and second class has increased, rail and steamship carriers have not been adversely affected by the loss of letter mail.

Who can fail to respond to the tremendous social significance implicit in this fundamental change of policy! It invests with romance the "grey detail of the Post Office." The ultimate, beneficial effects of its universal adoption, on the future relations between the peoples of the world, are well-nigh incalculable.

All progressive countries in Europe have accepted the principle. Why not the United States?

Let us put away, once and for all, the old, out-moded policy of dispatching mail by air only at the sender's option and at an additional charge. Let us give *every* American citizen the advantage of the best available delivery. Make the air the *normal* means of conveyance—instead of a luxury and an adventure. And then watch air transportation grow!



Captain E. E. Fresson, British airmail pioneer, supervises loading at Inverness, North Scotland



Behind the Scenes With the Engineers

(*Continued from page 30*)

trator, delivered the first complete exposition of the relationship between the C.A.A. and the aviation industry to be made public, in an address entitled "The Act, the Authority, and the Industry." He stressed the obligation placed on the Authority by law to encourage and promote the development of aviation in all its phases.

Opening paper of the technical sessions was delivered by Frederick C. Pyne, Aluminum Company of America. Titled "Ten Years' Service Experience With Alclad Materials in Aircraft," Pyne's paper was so optimistic as to corrosion resistance of Alclad, even when scratched, as to make production men present ask whether they shouldn't scrap the common sheet metal shop slogan "Scratched Alclad is scrapped Alclad." Pyne felt that some easing up of production procedure was justified although normal precautions should be continued. Most interesting phase of the report related to the electrolytic action set up at a deep scratch penetrating the pure aluminum surface layer to the core metal. Due to this action a corrosion resisting film forms almost immediately at the scratch and prevents further inroads into the core. It was found that substantial areas of the Alclad coating could be removed entirely and that, under normal corrosive action, this protective film would form over the exposed surface and protect it adequately. The author felt that it was unnecessary to use primers, paints, or protective coatings of any kind in connection with Alclad. F. R. Shanley, of Curtiss Wright Technical Institute, remarked in discussing the paper that the spot welding properties of Alclad were commendable. Also that we need some form of Alclad protection for extruded members. Peter A. Beck, Lockheed Aircraft Corp., session chairman and Mr. Bonham also of Lockheed discussed the pitting type of corrosive attack on Alclad, such as is experienced from the action of exhaust gases. Both felt that, though Alclad was safely resistant to such corrosive action, a protective coating was desirable for appearance sake, suggesting zinc chromate primer as ideal for this purpose. The author of the paper, in response to questions from the floor, said there was no evidence from service records of failures due to vibration fatigue developing from scratches in Alclad surfaces.

Stainless steels were then considered in an excellent paper by V. W. Whitmer, Republic Steel Corp. The paper "Stainless Steel in Aircraft" was read by Mr. Howard C. Stroup, also of Republic Steel Corp. Stainless steel alloys 18-8 and 18-8-S were specifically discussed, the latter being particularly applicable to exhaust manifolds, heaters, and other parts requiring high heat resistance. Alloy 18-8, also highly corrosion resistant, makes an excellent structural material as it develops a tensile strength of 185,000 pounds when cold rolled and fabricates easily due to its ductility. Although it has been used in sheet form in gages as light as .005 or .006 in. the author felt it more desirable to confine its use to .008 or .010 in. Such gages are not considered practical for skin covering of small aircraft, but have proved highly efficient for the heavily stressed members of larger planes. Other advantages of the material, such as its spot welding characteristics and is excellent corrosion resistance, were cited. For parts exposed to the constant action of sea water an alloy named 18 8-S-Mo is desirable. Exposure tests over a period of twelve years have shown this alloy immune to normal atmospheric corrosion. Stainless steel must be highly stressed in order to take advantage of the high strength of the material, said Mr. Cornwell, of the Budd Co., in commenting on the paper. Mr. Harold Aeker, who has worked for the Fuller Paint Co. in the development of zinc chromate primers, felt that much of our exposure testing has failed to investigate corrosion at seams, joints and corners.

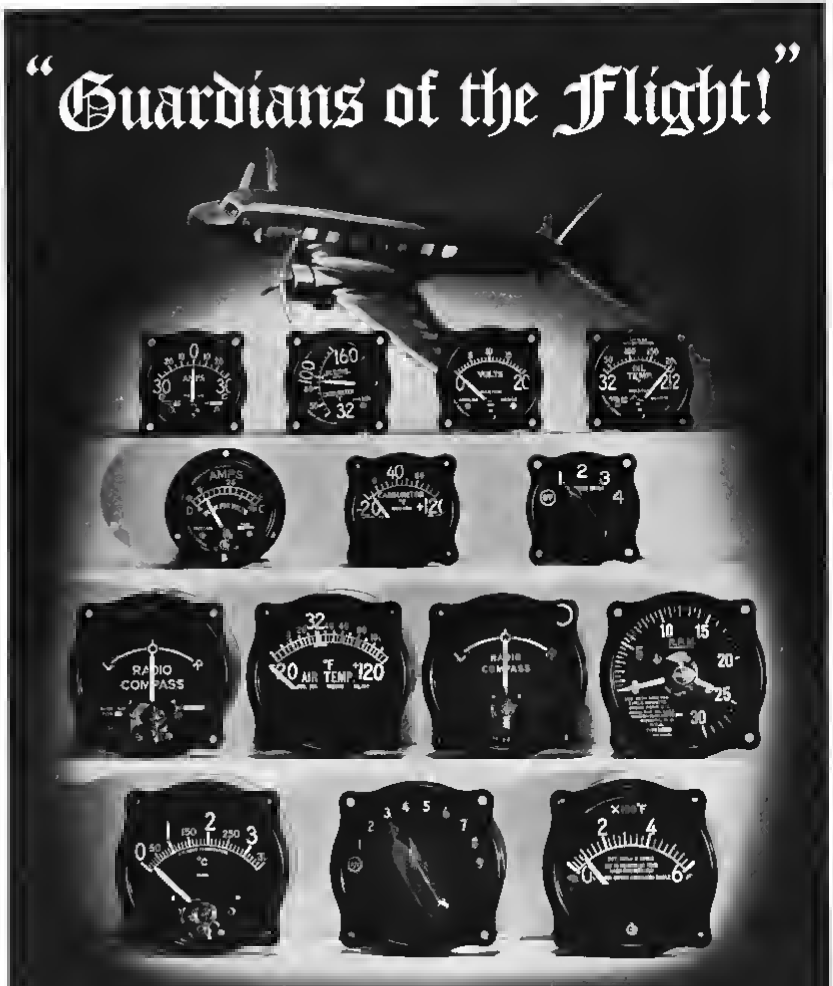
R. W. Palmer, Vultee Aircraft chief engineer, had charge of the Thursday evening session. An illustrated paper on "Measuring Surface Finish in Production," by Ernest J. Abbott, Physicists Research Company, brought physical demonstrations of the new Profilometer, which measures surface smoothness to the millionth of an inch. The author projected Profilometer reading on the screen so that everyone in the room could see him measure the smoothness of various machined parts which were at hand. The author pointed out that the Profilometer is a measure of roughness, as well as smoothness, as some manufacturers require that parts be held to a certain degree of roughness. Use of the Profilometer is helping manufacturers to simultaneously improve quality and reduce costs through better control of finishing processes. The Profilometer is relatively simple in theory and construction, consisting essentially of a tracer arm with a diamond point in contact with the surface to be measured. As the point moves on the surface the arm moves a coil in an electric field to generate a current proportional to the degree of roughness of the surface and this current operates the indicating needle.

The paper "Interpretation of Magnaflux Indications" by Bishop Clements, was read by G. P. Thorn, of Wright Aeronautical Corp. A second paper on the same subject followed, "Magnaflux, What does it Show?", by J. B. Johnson, M.E., chief, Material Branch, Wright Field, being read by L. L. Snow, Pratt & Whitney Aircraft. Both papers treated in some detail the several methods of using magnaflux, the types of imperfections disclosed, and the requirement that personnel using the magnaflux system must be specially qualified by training and experience for this work. Wide discussion of this paper followed and it was evident that use of magnaflux equipment has not been universally satisfactory, primarily due to lack of properly skilled operators. W. Lavern Howland, of California Institute of Technology, was surprised that neither paper had mentioned the X-ray method of inspection, which he considered the only method of making internal inspections of metal parts or of inspecting non-metallic metal parts. C. J. Nyquist, of the Magnaflux Corp., agreed that the X-ray process was valuable for sub-surface inspection work and thought that the two processes supplemented each other.

Howard D. Houghton, of Douglas Aircraft Co., served as chairman for the Friday morning meeting. The work being done at the Lockheed factory to help reduce costs through production engineering was well outlined by Harvey C. Christen in a paper entitled "Influence of Design on Cost." Christen stressed the need in production engineering of men with engineering knowledge possessing practical shop training. He cited examples of cost deductions on individual parts to three cents per unit from

(*Turn to page 74*)

"Guardians of the Flight!"



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(Continued from page 72)

seventy-five cents per unit, through adaptation of the Continental die process for cutting operations. He gave many specific examples of cost cutting, such as in the development of router equipment which permits a single operator to cut as much as 480 lineal feet per day of .020 aluminum alloy sheet stock, to a required form. Production engineering has often produced direct structural gains, or relaxed tolerances without penalizing serviceability, while all the time cutting costs. Peter F. Rossman, of the Curtiss Aeroplane Co., in discussion stressed his belief that designers should not be restricted by considerations of cost when planning a structure. T. P. Wright, of the Curtiss-Wright Corp., felt that the process of fastening parts together required more labor time than cutting and forming of parts. He thought production engineering might well be concentrated on reducing the cost of these fastening operations such as riveting. Dr. A. L. Klein commented that the structure of an airplane represents a much smaller portion of its cost than the various sub-assemblies and installations. He thought production engineering should be applied largely to such matters as plumbing, control systems, etc.

In delivering his paper on "Coordinating Engine Design and Production," A. H. Leak, of Wright Aeronautical Corp., stressed the need for improvement in production drawings, especially as to standardizing all drawings, and specifying all tolerances. In response to a question from Dr. Ernest J. Abbott, Mr. Leak agree that the Profilometer had proved a useful production control tool, but did not feel the Profilometer readings should be included among the tolerances listed on production drawings.

J. L. Atwood, North American Aviation chief engineer, had charge of the Friday afternoon session. G. S. Hausamann, of Eclipse Aviation Corp., read a paper on "Accessories and Flying Aids Contributing to Safety of Operations" which had been written by R. P. Lansing, also of Eclipse. The author presented a fascinating review of the progress made in recent years in the development of aircraft and aircraft engine accessories. Following the paper Mr. W. P. Hilliard, of Bendix Radio Corp., described the Bendix instrument landing system now being tested by United Airlines. The paper "Investigation of Vapor Lock in Aviation Fuel Systems," C. F. R. Progress Report," by Dr. O. C. Bridgeman, was read by C. B. Veal, of the S.A.E. Outlining the work of the Cooperative Fuel Research committee to date, this paper promised early solution of existing vapor lock problems, as well as gradual adoption of fuels with higher vapor pressures than those now commonly used. In commenting on the paper, C. C. Moore, Union Oil Co. of Calif., felt that engines should be produced to use fuels with double present vapor pressures. The Friday evening meeting had Hall L. Hibbard, Lockheed Aircraft Corp. chief engineer, as chairman. "Safety in Air Transportation" was discussed by J. A. Herlihy, director of engineering for United Air Lines, with a list of some of the things that had been done, and some that needed doing, to secure the perfectly safe airplane. Dr. A. L. Klein pointed out, in discussion, that safety measures were never actually such at all, but simply served to extend the useful limits of the airplane within a nearly fixed range of relative safety. Elmer P. Wheaton, of Douglas, replied to a question by F. M. Cole, Curtiss-Wright Tech., to say that his firm has successfully developed carbon pile vibration pick-ups to measure vibration in any specific plane, or in torque. A. E. Lombard, Jr., in giving his paper "Designing For Safety" confined his remarks largely to the new Curtiss-Wright 20 transport plane, and to the novel Dubl-Chek instrument board that has been developed for it. He stressed the point that pilots are already as nearly perfect as we can expect and that further improvement must come from the equipment itself. To accomplish this the C-W 20 transport will greatly simplify reading of instruments by the pilot through use of a new hook-up known as the Dubl-Chek system, which segregates instrument functions by flight categories such as "Take Off," "Climb," "Cruise," etc. The pilot sets his board for the proper flight category and then gets an automatic indication when anything goes wrong and is able to direct his attention at once to the instrument reporting the trouble. Dr. Klein was afraid the danger signal lights on the Dubl-Chek board might burn out at the wrong time, but T. P. Wright replied that the board Dubl-Check'd itself through notifying the pilot when a light burns out. Mr. Lombard also discussed in some detail the power boost system to be used on the Curtiss-Wright 20, by which the hydraulic power units of the Sperry automatic pilot system will be used to aid the pilot in manipulation of the controls when the automatic pilot is inoperative.

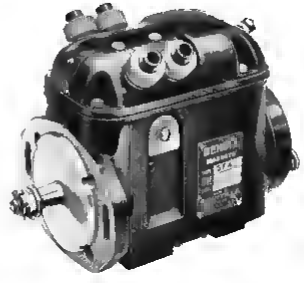
The final technical session, held Saturday morning, was devoted to aircraft accident causes and cures. With E. H. Heineman, chief engineer of the El Segundo Division of Douglas Aircraft Company acting as chairman, the first paper was "Notes on Loss Prevention in Civil Aviation," by Jerome Lederer, chief engineer, Aero Insurance Underwriters. Lederer stressed the fact that a large share of aviation insurance losses are not caused by aircraft accidents, but by such occurrences as hangar fires, windstorms etc. He was able to show from comprehensive tables of accident records developed by his company, that the number of accidents in miscellaneous flying has decreased relatively as the amount of flying has increased. He found serious and detailed fault with much of present day flying instruction, suggesting that flight instructors needed to be better educated and supervised for the work they are doing. C. E. Stryker commented that Lederer's findings were discouraging to the engineer, as they showed rather conclusively that personnel error is the major cause of accident, and that even if a perfectly safe airplane were built the accident rate would not decrease, due to the foolish things pilots would do resulting in accidents.

In the final paper of the session Stephen Ralle presented "A Survey of Mechanical Failures of Aircraft During 1936-37" as prepared by Gaylord W. Newton, chief of the Powerplant Branch, C.A.A. In discussion that followed Mr. W. M. Fairfield, of Fafnir Bearings, Inc., suggested that accessory manufacturers should contact service bases regularly in order to learn accurately of failures which might have an influence on accidents. Dr. A. L. Klein thought we should have more complete engine failure report forms in order to determine exactly the nature of failures that occur. He felt that many failures were being incorrectly reported. A. A. Mathewson, of Solar Aircraft Company, suggested that photographs should accompany all failure reports, and Ivar Shogran, of Douglas, thought that free-hand sketches would be a big help. C. E. Stryker, proposed that such an analysis of failures as that prepared by Mr. Newton should be presented annually in order that engineers might have a gage of progress in design with relation to safety and serviceability.

Unanimous!

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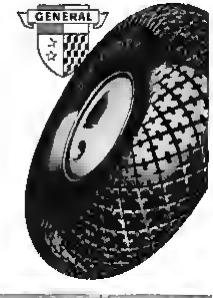


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Back to the Catapult

(Continued from page 27)

tained. In addition a valve was inserted between the reservoir and the engine which metered the flow and gave a much more uniform acceleration without an excessive "peak" force. The principal elements of launching conditions were demonstrated by this launching.

The name "catapult" reverts to about 400 B.C. It was used to denominate a type of war engine employed to hurl bolts, javelins, large stones and even flaming barrels of pitch in the attack and defence of besieged cities. Some were installed on Roman galleys. In effect these catapults were enormous bows, the bowstring being attached to long tapering arms, the heavy ends of which were embedded in twisted skeins of sinews, catgut, hair or the like. Drawing back the bight of the bow by means of tackles and windlasses served to store energy for the shot in the twisted skeins. Thus the maximum force came into action as soon as the bowstring was released.

Today catapults aboard naval vessels are of the turntable type. They are mounted amidships on cruisers or on the afterdeck of battleships. On battleships catapults are also mounted on the top of turrets which serve as turntables. In these types the engine is usually of the powder type. Of necessity aboard ship the length of the catapult is restricted.

In the early catapults the launching car went overboard at the end of the run but it was soon found practicable to bring the car to a stop at the end of the run without interfering with the launching. Provision for arresting the car, however, involves an increase in length of the catapult so that the space allotted for arresting is very limited and the deceleration is very high. It has been found necessary to use buffers to bring the car to rest similar to those used in absorbing the gun recoil of heavy guns.

Recently the Germans have adopted catapults for launching commercial airplanes, thereby securing to a high degree the advantages of assisted launching. Their demonstrations have been very successful. By using these catapults aboard a mother ship stationed in mid-Atlantic, they greatly increased the payload through the reduction of the gasload to that necessary for only half of the trans-ocean leg. Still more recently, in demonstrating North Atlantic crossings, station ships have been located in the Azores and in Long Island Sound.

Besides the types of engines already mentioned hydraulic types have been used abroad, some with multiplying rope purchases, and others utilizing direct drive by means of telescoping cylinders. Another interesting type is the flywheel type in which a flywheel is used to store the energy for launching. The flywheel is easily brought to speed, using moderate power in a few minutes. By connecting this high speed wheel to a tapering drum or fusee it is possible to start the towline slowly and to quickly build up speed to the launching speed with substantially a constant acceleration throughout the run at the end of which the flywheel is declutched.

Launching cars for seaplanes must provide support for the hull or the fuselage. Due to the conformation of the hulls or fuselages it is usually necessary to incorporate tumbling frames of one form or another which automatically fold down out of the way at the end of the run. Twin floats are more difficult to provide with the necessary attachments than is the case with a central float or boat hull.

Launching landplanes is fairly simple if the wheels rest in chocks on the launching car. The problem is more difficult if it is desired to roll the planes on their own wheels. The best arrangement closely follows that used for launching twin float seaplanes in which case it is usual to attach the fuselage to the launching car by means of folding frames.

Briefly the problem of "assisted launching" is to accelerate the airplane from rest to a desired launching speed more quickly than is possible if only the propeller thrust is used. The additional power required is high, for in only two or three seconds at most the catapult engine must do its work.

The actual launching divides itself into several phases. Warming up is the first phase in which the airplane and the car on which it is mounted must be restrained from moving ahead while the engines are warmed up and checked for satisfactory operation. The next phase is starting. In this phase the engines have already been brought to full power, and on signal from the pilot the launching car is released and the power of the catapult engine delivers the accelerating thrust for the launching. At this stage the lift and drag of the wings and the parasite drag of the airplane are nonexistant. The propeller thrust is the standing thrust, which adds to the force of the catapult in propelling the airplane. The application of these last two forces produces an acceleration so that the momentum of the plane acts rearwardly and it is necessary to restrain the airplane from nosing up under this action.

The third phase covers the condition from the instant the car moves forward until the end of the impulse run. Throughout this phase the wing lift, the wing drag and the parasite drag increase with the square of the speed, and the propeller thrust decreases slightly from the starting thrust to the thrust available at the launching speed. Still another retarding force comes into play due to the friction of the launching car. While this transition is taking place the lift of the wings is rapidly reducing the weight resting on the car, so that the nosing up tendency is steadily increasing.

During the power stroke of the catapult it is designed so that the catapult force is maintained as nearly as possible at a constant value so that the acceleration is also maintained nearly constant.

The last phase includes the discontinuance of the catapult impulse and the release of the fastenings securing the airplane to the car up to this point the arresting of the catapult car and the delivery of the airplane in free and controlled flight at the designed launching speed.

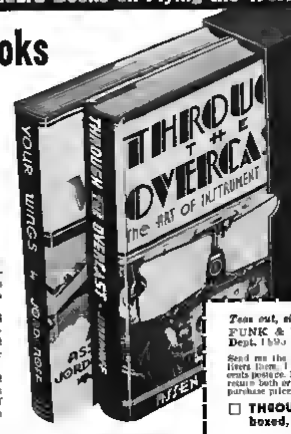
In its simplest form which will be used for illustration the seaplane is in contact with the car at three points. Forwardly, the attachments are made at the keel or at the chines in such a manner as to prevent the plane from nosing forward in the warming up stage, and to prevent the nose from rising while the catapult impulse is acting and the plane is gathering flying speed. Rearwardly, a similar attachment is provided to keep the plane from nosing forwardly in the warming up stage, and a point of support is provided to coact with the forward attachments in overcoming the tendency of the nose of the plane to rise under the influence of the catapult impulse. However, as soon as the catapult impulse is applied it is no longer necessary to hold down the airplane.

(Turn to page 78)

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(Continued from page 76)

rearwardly Because of this the hold down means at the rear attachment can be released at any desired point of the impulse stage

The impulse of the catapult is usually delivered by a chock on the car which bears against the main step This arrangement, however, does not provide for holding back the airplane on the car itself during the warming up stage so that separate means becomes necessary to restrain the plane from forward motion relative to the car until the catapult impulse is developed

Up to this point only those forces acting in the plane of symmetry have been given consideration It is necessary, however, that the attachments of the airplane to the car shall in addition provide means for preventing the plane from rolling laterally and from yawing relative to the car In general, the provision of the three points of attachment previously described will in themselves bring about cooperative action with the car so that these requirements will be incidentally met if the other conditions are taken care of.

The problem naturally resolves itself into two parts, first, the forces brought into play in the aircraft structure, and, second, the forces required and applied to the propulsion and arresting of the catapult car

Analysis of forces acting on the plane

On Fig 1 there are shown the principal forces and their points of application typical of the forces acting at different stages of a catapult launching Appended thereto is an explanation of the symbols used in the analysis and a set up of the equations showing the derivation of the three resultant forces brought into play between the airplane and the launching car

Equations 1, 2, and 3 show the general case of the forces acting during the catapult run

Equations 4, 5, and 6 show the forces in action while warming up the airplane, during which time no lift, drag or parasite resistance are present and the propeller thrust is a maximum and equal to the standing thrust of the propeller

Equations 7, 8 and 9 show the forces acting immediately after the car has been released and the airplane starts under the full impulse of the catapult In this case the lift, drag and parasite resistance are non existent and the thrust is again the standing thrust The difference between this and the preceding condition is the

(Turn to page 80)

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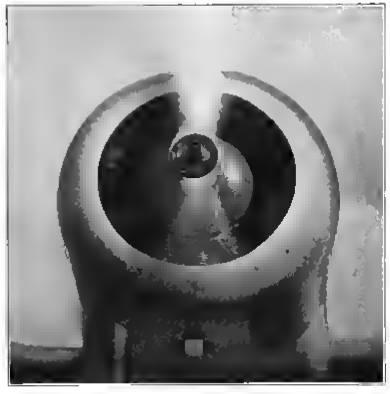
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About the Wages and Hours Law

(Continued from page 2?)

it is impossible to keep any record of their hours of employment through ordinary methods of the time clock. They are on a weekly salary and in the past have worked such hours as were required without expecting any overtime. What method can we adopt for paying them and conform to the law?

A. Better instruct them definitely to work not more than 44 hours a week, or work overtime when necessary and turn in their time for time and a half pay.

Q. Are supervisors, foremen and subforemen considered as administrators?

A. In all probability they would not be so held.

Q. Assuming an employee clocks in and out at the regular opening and closing time, but of his own volition after punching out, returns to his office to do extra work is it our responsibility to keep a record of such extra work and pay him for it?

A. Yes, an employee who performs valuable services overtime must be paid overtime even though he was not so instructed. The broad answer is that employers must tell employees (1) never work over 44 hours a week or (2) work overtime when necessary and turn in your time for overtime pay. Congress' intention was to make it economically disadvantageous for employers to work employees more than the hours maximum.

Q. A number of our employees, of course, are on weekly salaries but under the Act are entitled to receive extra pay for overtime. Assuming that we are on a 40-hour week, in case a salaried employee works less than 40 hours are we permitted to deduct from his salary an amount in proportion to the number of hours he worked less than the 40 hours?

A. The law says no provisions of this Act shall justify any employer in reducing his going wages. True you do not propose to reduce the workers *rate* per hour. But you would bring about an equivalent effect by docking him. The question would arise in court whether you did or would have docked him before October 24, whether you now do it as a result of the Act.

Q. What is the position of a manufacturing company a part of whose business consists of machine work for aircraft manufacturers, another portion of which consists of the manufacture of engines for aircraft, when the sum of these two is still a very minor part of the total volume of business?

A. If this manufacturer's main production is in interstate commerce he is covered by the law and probably the small percentage of machine work and engine manufacturing would be covered also even if they were not in interstate commerce. (They appear to be in.)

Q. (From an employee) Can an employer discharge a worker for filing a complaint or for testifying against the employer in court?

A. No. Discharge or discrimination for above reasons is forbidden.

Q. What is the position of a job shop, a portion of whose business is the manufacture of parts for aircraft, when such work constitutes a very small percentage of its total business?

A. There are no rulings on what percentage of his total goods an employer can ship in interstate commerce and still be exempt. Better comply till you know for sure you are exempt.

Q. Must a competitor or any person give his name when making a complaint against an employer?

A. No. Any person can make an anonymous complaint. Or he can give his name and the wage hour inspector will keep it confidential. This is true also of complaints to the Federal Trade Commission. Of course, a plaintiff cannot come into court unidentified.

Q. Can a worker employed 44 hours a week in one establishment put in additional time for another establishment?

A. Yes, provided the two employers are completely dissociated. Any attempt at a dummy set-up for evasion purposes would be risky.

Q. Could the aircraft industry apply for an industrial committee which would make a study and make recommendations to Administrator Andrews, who would then issue specific orders?

A. Yes, but there would be no point to it. The industry is not interested in the wage provisions and the Administrator has no jurisdiction over hours except as to exemptions. The 44-hour week comes down to 42 on October 24, 1939, and down to 40 on October 24, 1940.

Q. Will the wage hour office send out forms on which to keep records? Must I report to Washington?

A. No to both of these. There will be no forms. Employers may keep any kind of intelligible records. Social Security records are not acceptable as any part of the wage-hour record. Do not send reports to Washington, keep them on file for inspection.

Catapult

(Continued from page 78)

presence of the accelerating forces which brings in a retarding force *M* which tends to tilt the airplane rearwardly. For instance if the accelerating force is twice that of gravitation or "2g" the force *M* is twice the weight of the plane and acts horizontally.

Equations 10, 11 and 12 show the analysis of forces at the end of the run at the instant the accelerating force fades to zero immediately before the airplane is released. At this time the wing lift is equal to the weight of the plane the wing drag is equal to that existing at the getaway speed and the parasite drag and the thrust are also equal to their values at the getaway speed.

Equations 13 and 14 show the forces present at the instant the airplane is released.

Examination of equations 10, 11, 12, 13, and 14 will show that since the line of thrust and the lift are not coincident with the center of gravity slight disturbing factors are present at the end of the run and at the instant of release. Actually such conditions generally exist but through the use of the elevator are instantly corrected by the pilot before any disturbance in attitude can take place. Since it is assumed that the airplane is launched at a speed in excess of stalling speed, adequate control is always available.

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Used Planes

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U. S. Government

WAR DEPARTMENT Office of the Contracting Officer, Air Corps, Materiel Division, Wright Field, Dayton, Ohio, June 24, 1939. To Airplane Designers and Manufacturers.—The War Department invites the attention to competition by sealed communications of new designs covering Single-Engine, Radio-Controlled Target Airplane complete with all ground control and operating equipment, together with statement of price for which any such design in whole or in part will be sold to the Government. Communications containing designs and prices thereto must be submitted to the Contracting Officer, Wright Field, Dayton, Ohio, not later than November 18, 1939; no communications received after 4:30 P. M. Eastern Standard Time on said date shall be considered. Winner or winners of this competition will be determined as provided in the Act of July 2, 1918 (44 Stat. 788). The Government will require not to exceed one hundred (100) of the type of airplane referred to and will reserve the right to contract with a winner of the design competition for the construction of said airplanes in the event that said winner is qualified to manufacture same. A copy of the circular proposal covering this design competition and containing instructions in regard thereto will be furnished upon application therefor to the Contracting Officer, Wright Field, Dayton, Ohio. E. T. Kennedy, Major, Air Corps Contracting Officer.

WAR DEPARTMENT, Materiel Division Air Corps, Wright Field Dayton Ohio Office of the Contracting Officer.—The War Department invites the submission in competition of sealed bids covering airplanes under conditions set forth more particularly in the following advertisement Circular Proposal No. 39-480, dated October 27, 1938. Airplanes, Basic Combat Type: Single Engine described in Air Corps Specification C-981 dated September 1, 1938 bids to be submitted to the Contracting Officer not later than 4:00 P.M. Eastern Standard Time April 24, 1939. Full particulars with respect to said advertisement may be obtained upon application to the Contracting Officer, Wright Field, Dayton, Ohio.

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32,000 PEOPLE NEEDED FOR JOBS IN AVIATION IN THE NEXT 5 YEARS

Dr. Norcross predicts that in the air-line branch of aeronautics there will be an increase in personnel of between 12% and 15% each year for the next five years. This increase will practically double the number of present employees in this one branch of aviation.

Aviation factories, now the largest single division of aeronautics, at present employ about 40,000 people. Dr. Norcross sees this number increased to approximately 64,000 by the end of 1943.

In "GETTING A JOB IN AVIATION," Dr. Norcross states: "Aviation is definitely the number one vocation in popularity. But despite the thousands of young men who are knocking at aviation's gates, employment managers of air-lines, factories and airports are having real difficulty in finding the kind of men they are looking for. Higher personnel standards exist in aviation than in almost any other kind of work. Factory employees in aircraft and engine plants work to precision tolerances that are unheard of in other industries. Air-line personnel, from pilots on down to men who polish the outsides of airplanes, is chosen with meticulous care. Mechanics who service private airplanes may present the greasy appearance of garage mechanics, but the aircraft workers have such responsible jobs that they must have completed an exacting course of training and have passed difficult tests set up by the Federal Government."

Aviation is now so specialized, states Dr. Norcross, that it is practically imperative for a young man to *secure special training* before he is able to get a job

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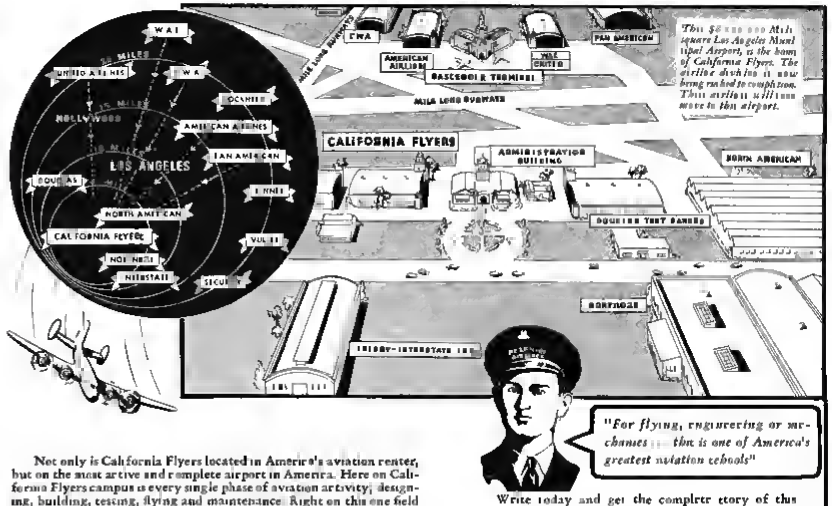
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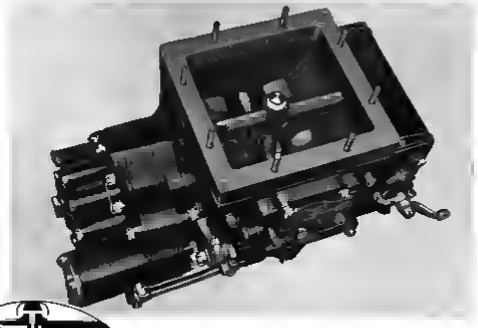
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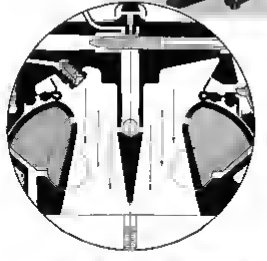
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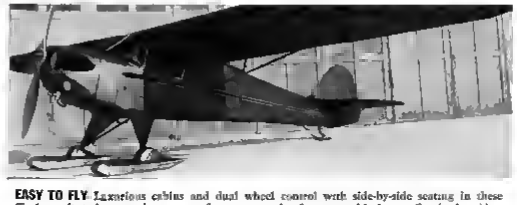
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